DOCUMENT RESUME

ED 070 349 FL 003 680

TITLE	Technical Cooperation with Iran: A Case Study of Opportunities and Policy Implications for the United States. Report to the Agency for International Development.
INSTITUTION	Agency for International Development (Dept. of State), Washington, D.C.
PUB DATE	11 Apr 72
NOTE	114p.
EDRS PRICE	MF-$0.65 HC-$6.58
DESCRIPTORS	*Developing Nations; *Economic Development; Economic Factors; Economic Research; Economic Status; *Federal Aid; Federal Government; Federal Programs; Industrialization; *International Programs; *Technical Assistance; Technological Advancement
IDENTIFIERS	*Iran

ABSTRACT

This report concerns aspects of the United States' changing policies for providing economic and technical assistance to developing nations. Of primary importance in a review of relationships with those rapidly developing nations no longer eligible for concessional assistance from the Agency for International Development (AID) are the possible mutual benefits from application of U.S. expertise in selected economic sectors. A team of American specialists from AID explores the possibilities for an expanded technical cooperation with Iran in this report. Results of the study indicate Iranian desire for increased American advisory expertise in several areas, particularly in agronomy and in mineral resources development. Identification of these and other opportunities for technical cooperation leads the American advisors to recommend vigorous follow-up by appropriate U.S. agencies. (RL)

ED 070349

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Technical Cooperation With Iran

A Case Study of Opportunities and Policy Implications for the United States

Report to the Agency for International Development

April 11, 1972

FILMED FROM BEST AVAILABLE COPY

FL 003 680

Agency for International Development
Washington, D.C. 20523

This Report was photocomposed with input generated on a time-shared terminal and processed through the Computer-Assisted Typesetting System at the National Bureau of Standards.

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Abstract

Policies of the United States for providing economic assistance to the developing nations of the world are under close scrutiny at the present time. The Administration and the Congress have challenged traditional policies and practices, and the President has proposed a major overhaul of the mechanisms through which the United States has provided economic and technical assistance for the past 25 years. An important aspect of U.S. policy involved in this review concerns relationships with those rapidly developing nations which are no longer eligible for concessional assistance from the Agency for International Development (A.I.D.) but where there can be mutual benefits from application of U.S. expertise in selected economic sectors. Guidance is needed at operating levels within A.I.D. and other governmental agencies for the establishment of long-range, but flexible, practices for developing the relationships with these countries.

One such country is Iran. In 1967 the A.I.D. program of concessional assistance to Iran was terminated. Although many of the personal and institutional associations that were established during the period of concessional assistance have remained active, A.I.D. and Embassy officials have been aware of numerous Iranian activities in which new and closer ties would probably benefit both countries. A.I.D. officials have considered possible institutional roles for their own and other U.S. agencies in helping to establish and strengthen such ties in countries in stages of development similar to Iran's. To carry out a case study from which general guidance could be obtained, the Technical Assistance Bureau of A.I.D. sent a team of American specialists to Iran in January 1972 to explore possibilities for expanded technical cooperation. During the course of discussions with representatives of numerous Iranian Ministries, universities, and industrial establishments, many such opportunities were identified. Highest priority in the Iranian Government's Fifth 5-Year Plan beginning in 1973 is to be agriculture, with emphasis on expanded protein production, particularly meat; the Ministry of Agriculture would welcome U.S. knowledge and experience. Next in priority is the development of Iran's mineral wealth which is believed to be very great; the Ministry of Economy would like U.S. cooperation in accelerating the mapping, exploration, and production of Iran's mineral resources and in strengthening its mineral agencies. Additional exchanges of professors and students between Iranian and American universities, although already at a high level, could benefit scholarship in both countries.

Identification of these and other opportunities for technical cooperation led the American team to recommend vigorous followup by appropriate U.S. agencies. Recommendations are also made for strengthening the A.I.D. capability to assist Iran and countries in a similar development status, to identify

needs for expertise, and to help locate American individuals and institutions that might respond to such needs. The U.S. team especially emphasizes the need for adoption of well-formulated policy to guide U.S. technical cooperation with countries no longer eligible for concessional assistance.

Summary of Recommendations

A. A.I.D. and Department of State should give close attention to followup by Federal agencies to team's visit. Highest priority should be given to Iran's desire for help on protein production program. Importance of other opportunities for technical cooperation should be brought to attention of appropriate agencies. (p. 25)

B. An increased priority of U.S. Government attention to newly self-sustaining nations such as Iran should replace the present practice of giving them less attention than those receiving concessional aid. (p. 26)

C. The growing political and commercial importance of Iran and similar countries to the United States justifies investments by the U.S. Government to ensure that they are aware of and have access to responsive sources of U.S. public and private expertise. To the extent that more tangible U.S. self-interest in technical cooperation can be demonstrated, the use of U.S. public funds to share the cost of technical cooperation is justified. The criteria for determining U.S. self-interest, however, should be stringent. (p. 27)

D. As a channel for requests for reimbursable technical services, A.I.D. has responsibility for ensuring, in cooperation with the qualified Federal agencies, that the U.S. interest is properly identified, that priorities for U.S. Government attention at high levels are set, and that the response of the agencies is timely and of appropriate quality. (p. 28)

E. If the A.I.D. Administrator and Secretary of State agree with the team that technical cooperation with non-A.I.D. countries like Iran should compete favorably for priority with countries receiving concessional assistance and that A.I.D. should have lead agency responsibility, then A.I.D. should be organized to do the job. Among the capabilities needed are:

(1) Resources (a) to mobilize survey teams in special cases to make country assessments of the status of cooperative activities and opportunities, and (b) to follow these up with selected experts to pursue particularly important opportunities to determine quickly whether they merit a high-level effort by the United States.

(2) A clear Congressional charter for A.I.D. to sustain the interests and capabilities of a spectrum of non-commercial U.S. institutions on which bilateral institutional relationships with Iran and similar countries depend.

(3) Resources, backed up by recognition at highest agency levels of the importance of the program, to ensure that U.S. Federal agencies can and will respond to priority reimbursed assistance opportunities in a manner consistent with considerations of foreign policy objectives. Responsibility for seeking appropriated funds to strengthen agency

capabilities to respond should remain with the agencies themselves to the extent they can justify it legislatively as related to their own special missions. But when the benefits relate to general U.S. goals, A.I.D. should seek the needed funds.

(4) An interagency consultative mechanism to further technical cooperation activities should be assembled under the chairmanship of A.I.D. (and perhaps under the aegis of the Federal Council for Science and Technology) to give further consideration to practical policies to improve the effectiveness of the agencies in international technical cooperation. (pp. 29–31)

F. Since many of the above recommendations parallel capabilities proposed for the International Development Institute (IDI), the team believes that U.S. relationships with self-sustaining, developing countries should be considered an important additional justification for the formation of IDI. However, first steps toward establishing these capabilities can be taken without waiting for IDI. (p. 31–32)

G. The need for and scope of a bilateral cooperation agreement with Iran should be determined by the State Department and other agencies concerned. If it is needed but would cover only scientific research and related academic interchange, then the U.S. National Science Foundation should be the lead agency in the U.S. If it should cover provision of technical and managerial services broadly, however, then A.I.D. might be the appropriate lead agency. In either case the appropriate agency in Iran would be selected by the proper governmental authorities in that country. (p. 32)

TECHNICAL COOPERATION WITH IRAN

A Case Study of Opportunities and Policy Implications for the United States

I. PURPOSE AND METHODS OF THE STUDY

A. Charge to the Study Team

The Secretary of State, in a letter[1] to Dr. Hannah, A.I.D. Administrator, stated:

> . . . the United States is not now taking advantage of the increasing opportunities for useful technical cooperation especially with former AID and non-AID developing countries. Such association could serve to promote U.S. commercial interests as well as our interests in improved international relations and understanding while also being of value to a wide variety of U.S. Government agencies and private organizations.
>
> At present there is no adequate institutional mechanism for identifying . . . opportunities and for facilitating relationships at the technical level among Government agencies, universities, industrial concerns, and other private organizations of the United States and the post AID countries . . . I consider the repair of these deficiencies to be a matter of some urgency.

Dr. Hannah, in November 1971, requested a team of individuals (see app. 1) to prepare a report examining the issues deriving from Secretary Rogers' letter as they relate to one country: Iran.

The team was asked to "Obtain information and insights useful to the consideration of policies and legislation on U.S. programs of technical exchange and reimbursable technical services." As a basis for such conclusions, the report should:

Analyze past U.S.-Iran technical cooperation activities, especially

[1] Letter, Secretary Rogers to Administrator Hannah, Jan. 20, 1970.

since termination of the A.I.D. program in Iran in 1967.

Identify promising fields for U.S.-Iran technical cooperation in the absence of the A.I.D. program (concessional assistance) including, to the extent feasible, specific possibilities for mutually beneficial projects.

Determine the techniques, mechanisms, and other arrangements needed on both sides to facilitate technical cooperation between public and private organizations in the two countries. This will include examination of current practices of Iranian organizations in obtaining technical services from the United States and other countries.

Provide perspective and framework for technical cooperation activities of other Federal agencies in particular fields in Iran; and set standards for similar surveys that may be undertaken in other countries.

By undertaking the study in Iran, the team would: "Demonstrate U.S. interest in finding ways of expanding mutually beneficial technical cooperation between United States and Iranian institutions."

B. Scope of the Inquiry

Since Iran is financially capable of purchasing professional and technical services, it was necessary to consider the full range of relationships and mechanisms for technical cooperation, including private sector and multinational relationships. Accordingly the scope of the study was discussed with and endorsed by the Department of State and the Office of Science and Technology, Executive Office of the President, as well as A.I.D.[2]

For the same reason, the team comprised individuals from both public and private sectors, with extensive prior experience in technical assistance programs and policy development. Professional experience of the team included: agricultural sciences, water resources, earth and mineral exploration sciences, housing and urban planning, economic development, industrial standardization and development, scientific and technical information, atomic energy, academic research support and both R&D and A.I.D. mission management.

The team, prior to and during the mission to Iran, met with a total of 250 Iranian officials and professionals, U.S. and Iranian businessmen, Americans with both official and private expertise in Iranian development and its scientific and professional basis. These individuals are identified in appendix 2. But just as the selection for study of one country, Iran, limits our ability to generalize our conclusions to other countries that may be in a similar stage of development, the completeness of coverage of opportunities for technical cooperation in Iran is limited by the team's expertise. The team did not attempt to examine these sectors: health services, communications, social services, petroleum technologies, meteorology and oceanography, transportation or military technology. Thus, although the experience of the team and the

[2] Telegram, Department of State to American Embassy, Tehran, State 203754, Dec. 23, 1971.

areas examined[3] included the sectors described to us by the Government of Iran (GOI) as having high priority in their development plans, our assessment only samples the opportunities for cooperation; others of equal significance to both countries may well arise. When they do, they should receive appropriate attention in accordance with the recommendations of this report.[4]

C. Definitions

Considerable ambiguity attaches to the words "technical," "sciences," and "technology" when they are used in this context. We use the adjective "technical" to comprise the full range of professional skills and activities essential for social and economic development: sciences, engineering, development economics, planning, management, and other specialized professional fields. "Technical activities" includes the pursuit of these disciplines in research, as well as their application in commercial, public sector, and educational activities. Lacking an equivalent noun, we may use "science and technology," recognizing that the correctly broad meaning of "technology" is intended.

For convenience, we will use "technical assistance" when substantial concessional aid is provided by the United States in recognition of the balance of payments deficits of less developed countries. In "technical cooperation" the costs are distributed in proportion to the national self-interest of the two parties, with the primary or entire burden usually falling on the country receiving most or all of the benefits. Thus, both fully reimbursable technical services and jointly sponsored activities from which both parties benefit ("technical exchange") are included in the concept "technical cooperation."

[3] Agriculture, minerals development, water resources, regional and urban planning, industrial development, power development, housing, academic science and engineering, development planning, and management.

[4] The report contains the views of team members and does not, therefore, necessarily reflect the views of the Agency for International Development or U.S. foreign policy.

II. RATIONALE AND OPPORTUNITIES FOR TECHNICAL COOPERATION WITH IRAN

A. U.S. Interest in Economic and Social Development in Iran (see app. 3)

Among the nations from NATO countries in the West to Japan in the East, Iran stands out as a stable and rapidly developing nation, whose economy is growing at an impressive rate (averaging 10% per annum increase in GNP during 1965-70) through a national commitment to development on the Western pattern. Per capita GNP (in constant 1970 prices) has increased almost 40% during the last 5 years, from $256 in 1965 to $355 in 1970. Iran possesses more than one-tenth of the free world's known oil reserves. Seventy percent of its oil exports are directed to Japan and Western Europe. In 1970 it provided about 40% of the oil needs of Japan and 7% of the total requirements of all the European OECD Member countries.[5] Figures for 1971 are expected to show increasing reliance on Iranian oil by the latter countries.

Iran's mineral potential, unexploited and only partially identified, may prove one of the richest sources of a number of raw materials in increasing demand by all industrialized nations. As a nation receptive to foreign capital investment, able to provide for its own national security and with excellent political relations with the United States, Iran is a stabilizing force in the Middle East and South Asia, an important contributor to U.S. objectives for peace, social progress, and mutually beneficial world trade.

Iran also figures importantly in U.S. long-term economic objectives. Our increase in balance of payments deficits in raw materials indicates the need to be able to compete in the world market for minerals without discrimination. Rapidly increasing imports of labor-intensive manufactured goods combine with the U.S. natural resources deficit to require steadily increasing foreign sales of U.S. capital goods and technologically intensive products.[6] Only those less developed countries (LDC's) that become economically self-sustaining will have the purchasing power and the requirement for the products and services for which the United States is competitive.

If only for this reason, the development of the entire Middle East region is in our economic interest, as well as in the interest of the people themselves. Among Middle-Eastern countries, Iran perhaps has the best prospect of contributing to regional development.

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[5] Source: A.I.D. Office of Statistics and Reports.

[6] Secretary of Commerce Maurice Stans' Testimony to House Committee on Science and Astronautics, Subcommittee on Science, Research and Development on July 24, 1971.

B. Iran's Prospects for Success

There are reasons to believe that Iran can be successful in continuing her present pace of development. Oil revenues provide over $2 billion per annum, 80% of which has in the past been available for the country's development budget. Iranians are commercially oriented and demonstrate strong entrepreneurial abilities. They are committed to encouraging enterprise and are aggressive about importing modern industrial technology. Since Iran does not now have the infrastructure to develop indigenous industrial technology, importation in this fashion is its only practical path to industrialization. The Government's commitment to free enterprise is qualified by an inclination to establish competitive public-sector business as well and by a requirement that majority control remain in Iranian hands.[7]

Iran has a strong central government which, under the leadership of His Imperial Majesty, has made major strides not only in the economic sphere, demonstrated by the rise in personal income, but in wrenching Iran from the grip of feudalism in a remarkably short time. Applying both political liberalization and restraint in measured fashion, the Government is making impressive efforts to steer a course between satisfying social wants and encouraging unrealistic expectations. The prospect for continued political stability and social and economic development is thus better than elsewhere in the region.

The importance to the United States of Iranian development, and recognition of these favorable prospects, led to A.I.D. economic assistance amounting to $600 million[8] in the period from 1952 to 1967. Total U.S. economic assistance to Iran during this period, including the Food for Peace programs and Export-Import Bank loans, amounted to almost $1 billion. In 1967 the improved standard of living, the favorable balance of payments, and the convertibility of the Iranian rial led to the phasing out by the United States of concessional capital and technical assistance. Since 1967 there has been no A.I.D. mission staff in Tehran, and no special in-country provision for continuing U.S. technical cooperation activities on a non-concessional basis.

It should not be assumed, however, that Iran does not continue to need technical help (the high-technology component of the national economy is based almost 100% on imported turnkey technology) or that no obstacles to continued stability and progress can arise.

Iran's population continues to grow at about 3% annually. The rising per capita income produces additional consumer demand, especially for higher quality food and shelter, which must to some extent be accommodated. These two forces lead the GOI Plan Organization (PlanOrg) to project minimum requirements for 8% annual growth rate in meat production and

[7] Although joint ventures in the private sector are common and growing, and the top leadership of the GOI recently went to New York to encourage U.S. capital investment in Iran (the second U.S.-Iran Investment Conference) most of the major non-petroleum manufacturing enterprises in Iran are Government-owned or controlled.

[8] Source: "U.S. Economic Assistance Administered by the Agency for International Development and Predecessor Agencies, Apr. 3, 1948-June 30, 1970."

similar rates for other consumer commodities and services to contain and satisfy public expectations.

Regional political turmoil and pressures from Iran's neighbors, combined with the end of British military presence in the Persian Gulf, result in national defense budgets (about $1 billion in 1971/72) which compete for resources that could otherwise be used for development.

Although Iran's leadership elite is highly competent and professionally educated, there is a pervasive and serious lack of middle management depth. A parallel lack is at the practical professional level—industrial engineers, operating and service personnel of all types.

Iran's industrialization is proceeding in the most rapid way possible, importing both technology and with it the personnel to establish and troubleshoot production lines. Thus, industrialization is insulated from the shortcomings of Iran's professional and institutional infrastructure. Weakly rooted in Iran's indigenous capability, industrialization is dependent on continued commercial and technical cooperation, and the oil revenues to attract it. Economic self-reliance, though perhaps established in fiscal terms, is not yet a reality in terms of professional and managerial skills and supporting infrastructure.

In summary, the development job is well begun and performance is impressive but the task is far from complete.

C. Criteria for U.S. Investment in Technical Cooperation with Iran

Because of the clearly proper policy of phasing out capital assistance to less-developed countries when their financial condition makes our loans or grants unnecessary, many have assumed that this policy should apply to technical cooperation as well. Technical services to nations no longer requiring concessional capital aid have been provided only when reimbursed. Inadequate provision has been made even to encourage U.S. Government agency responsiveness to such requests for reimbursable help.

Yet U.S. private-sector organizations provide technical services to Iran at their own expense when it is to their potential advantage to do so. For example, a well-done proposal for a technical study may be of considerable value to the GOI even if no contract is let.

Governments of other industrialized nations—France, United Kingdom, U.S.S.R., Germany, and Japan in particular—sponsor technical assistance activities in Iran (see app. 4) concurrently with the much larger-scale private- or public-sector investment, sales, and other commercial arrangements. While the team does not propose that we match the bilateral technical assistance programs of other countries, the U.S. Government should make an investment in technical cooperation with Iran in accordance with the criteria suggested in this report.

The policy toward technical cooperation with nations in different stages of development must evolve with the nations themselves. At one extreme—the poorest and most helpless country—virtually all of the dollar costs and much

of the leadership commitment must be provided by the United States and other donor nations if the developing country is to be helped materially. At higher levels of development the host country can and should contribute more and more. A country emerging into industrialization, like Iran, might have enough capital to pay for technical cooperation, but the United States must still make an important investment if the cooperation is to be fruitful—not an investment of dollars alone, but of commitment of the time and attention of substantial elements of the Federal Government.

At later stages of national development, as higher levels of industrialization are reached, demonstrable U.S. private-sector self-interest in cooperation provides adequate stimulation to that commitment. But the benefits to the United States of technical cooperation with rapidly developing countries like Iran tend to be diffused and apply to the United States as a whole. Thus, we must identify the criteria by which technical cooperation opportunities should be evaluated to assess the degree of U.S. commitment and investment they deserve.

We consider altruism a valid motive but not a very useful criterion. Every American President in recent years has made eloquent public statements proclaiming the desire of Americans to share the skills and knowledge that built our great country with those for whom hunger, disease, ignorance, and fear are daily companions. As much as cynics may decry the "do-gooder," and as hard as it is to distinguish between actions that help from those that do not, most Americans seem inclined to support the "Point IV" concept of sharing our knowledge and our creative spirit, though the earlier concept of sharing our dollars as well is not now so strongly supported as it once was.

Nonetheless, to plan a technical cooperation program based on altruism as the primary criterion for program choice makes choosing very difficult. The team prefers to accept an altruistic motive as a powerful source of commitment to international development activity, but to use practicability, significance of effort, host country commitment and, above all, the U.S. national interest as the means for allocating priorities among altruistically meritorious alternatives.

D. Iran's Plans and Priorities: Needs for Technical Cooperation

Central responsibility for development planning and financing lies in the Government of Iran Plan Organization, which at this writing is generating the Fifth 5-Year Plan for 1973-78. During this period the GOI expects capital investments of $23 billion of which 60% will be in the public sector. Of public funds $10 billion is expected from oil revenue. The goal is to increase GNP at 9.5% per year, a rate already being exceeded, and to balance the economy by shifting first priority emphasis to agriculture.[9] Per capita annual income is expected to rise from $370 in 1971 to $650 in 1977.

Priority areas, described to the team by PlanOrg and by the responsible

[9] During the Fourth Plan years, annual growth in the industrial sector was 13-15%, while in agriculture, it was only 3%, a rate which Iran hopes to double in the next plan.

Ministries, are summarized briefly below. The most important areas are discussed separately at greater length in appendices, with special attention being paid to identification of current or likely needs for technical help that might be purchased from U.S. or competing sources.

(1) Agriculture (see app. 5)

Unless the annual rate of increase of agricultural production is nearly doubled, population and market pressure for food will force sharp increases in the importation of food, e.g., 400,000 tons of red meat per year by 1975. Additional costs for the extra infrastructure to absorb and distribute such imports would also be large.

The Ministry of Agriculture expects that of the total of $23 billion to be invested in the next plan, $4.6 billion would be for agricultural development. Highest priority attaches to protein production, primarily from beef and mutton, by a drastic transformation of the present nomadic animal husbandry on badly overgrazed land to vertically integrated, industrialized meat production. The task is recognized by the GOI to be a monumental one, and is considered by the Ministry of Agriculture to require establishment of feedlots and rural towns to reduce both animal and human nomad population on grazing lands, increased production of feed grains, introduction of new animal breeds while contending with attendant ecological problems, construction of slaughterhouses and refrigeration and packing plants in the new towns, and establishment of a transportation and marketing network for the product.

U.S. experience is certainly relevant here (Hawaiian Agronomics, Inc., is now planning a 15,000 hectare meat production operation in Azerbaijan) but the social and institutional problems that lie ahead are sobering. Most important, the details of what is to be done to achieve the desired objectives are far from clear at this stage. It is to remedy this deficiency and set the project on a sound course that Agriculture Minister Ruhani expressed (both to our team and to USDA Secretary Butz in Washington) his desire to engage a team of U.S. experts to take a major responsibility for defining the program and planning it. In addition, he may request assistance to establish or strengthen regional experiment stations and other applied research institutions.

U.S. interest in responding to such a request should match the project's significance to Iran's future as the number one element in their Fifth 5-Year Plan. If successful, the project would contribute to meeting the world food problem, perhaps in time providing a potential for export to neighboring countries. In any case the experience would be exceedingly valuable to the entire region. An initial requirement for U.S. feed grains and breeding stock, plus longer range markets for capital goods for the associated industrial activity, also provides a possible economic motive to respond to Iran's requirement. However, we should not be associated with a program of such economic and political significance for Iran unless we are prepared to make a substantial U.S. commitment. Such a commitment—not of dollars but of high-level attention in the U.S. Government, especially USDA and A.I.D.—

would be absolutely essential if the United States responds to this technical cooperation opportunity.

(2) Mineral Exploration and Development (see app. 6)

Second in priority is development of mineral resources—a still largely untapped source of exportable product with the further virtue that employment generated is in rural areas, providing nomads and peasants displaced by mechanized agriculture (or simply by increasing unacceptability of marginal subsistence living) an alternative to joining the burgeoning urban unemployed.

Experts agree that Iran has exceptional potential (probably best in the Middle East) for discovery and development of exportable mineral raw materials (e.g., copper, lead, zinc, molybdenum, tungsten, chromite ores) as well as raw materials for local industry (fertilizers, chemicals, ceramics, refractories, construction materials) which could substantially augment its export income from oil and reduce import requirements. For example, the recently discovered copper deposits at Sar Chesmeh in Southern Iran have an estimated reserve of 400 million tons, averaging slightly less than 1% in metallic copper. This deposit compares favorably with some of the larger deposits in South America.

Officials of the Ministry of Economy and the Iranian Geological Survey described needs for help in three areas:

(a) Geological mapping and mineral appraisal.—Iran needs the cooperation of the U.S. Department of Interior's Geological Survey (USGS) in accelerating and coordinating a national geological mapping program, introducing new techniques for mapping, and increasing its capacity for compiling and publishing maps. Iran also needs the U.S. Geological Survey's help in developing greater competence in geochemical, geophysical, analytical, and data-processing techniques required for systematic appraisal of Iran's mineral potential. The Iranian Geological Survey is familiar with the USGS involvement in Saudi Arabia, where about 25 USGS employees are now helping to conduct a comprehensive national survey and train Saudi Arabian counterparts in a program funded entirely by the Saudi Arabian Government. A request for a similar program in Iran may be submitted to the USGS.

(b) Mining technology and development.—Iran needs to import technology and to provide technical guidance and financial help to small-mine operators. To some extent, Iran also needs assistance in planning for the development of large-mine operations. The services involved are familiar to the U.S. Bureau of Mines (USBM) and the USGS but are not yet effectively established in Iran, although the need for them has been identified by the Ministry of Economy and PlanOrg.

Exploitation of mineral resources is, of course, a matter of intense interest to mining companies from many nations, all offering a variety of package deals to Iran in return for mineral concessions. The GOI has rejected all such offers for the Sar Chesmeh deposits and has decided to establish a public corporation for the purpose, despite the difficulties of hiring and organizing individuals instead of contracting with an established mining concern that

would stand behind the performance of its personnel. The GOI is exploring possibilities of help from major American metal producers to assist the corporation in the development of this major resource. It has employed Mr. Charles Brinkerhoff, former Board Chairman of Anaconda Copper, as mining consultant. He is expected to recruit a number of experienced Americans to help staff the Iranian company. This illustrates both the importance of GOI officials attach to obtaining the services of U.S. technical experts and their capability to do so outside U.S. Government channels.

(c) **Mining program definition and planning.**—Both PlanOrg and the Ministry of Economy expressed need for expert assistance on a non-commercial basis to help identify courses of action in setting up mineral exploration and development programs, and to ensure that the feasibility studies prepared by commercial consulting firms are focused on the right problems and produce plans capable of implementation.

The U.S. self-interest in welcoming Iranian requests for help from American experts is clear enough and unexceptionable. Our minerals companies would naturally like to have a full opportunity to compete for any mineral extraction opportunities that Iran leaves to the private sector and to have a fair share of the mineral production needed by our industry and purchased at free market prices. U.S. experts in helping the GOI would, as natural byproducts, increase awareness by the GOI of U.S. technical and commercial capabilities and create opportunities for U.S. firms. The same byproducts, of course, accompany the work of Japanese and certain Western European country experts, and for this reason these nations offer expert advisers to the GOI mining offices on a 100% concessional basis.

(3) Social Services (Education) (see app. 7)

Third priority in Iran's Fifth 5-Year Plan is expected to be social services, with primary emphasis given to education and health services. Emphasis in education will be on teacher and vocational training. Considerable pressure exists for university expansion due to strong Iranian desire for education, although it is not clear that the economy can now employ all the graduates in their fields of education.[10]

Significant opportunities to help the development of Iran's best universities may arise; the funding is expected to come from these institutions, rather than directly from the Government. In science, engineering, and medicine, the best institutions are Pahlavi University in Shiraz and Arya Mehr University, now located in Tehran but the main campus is being planned for Isfahan. Both universities are sponsored by His Imperial Majesty and are "private" in the sense that they are not under the direct jurisdiction of the Ministry of Science and Higher Education. The more recently established Arya Mehr stresses engineering and related sciences, and seeks to be comparable to MIT and other leading engineering institutions.

Both universities are accustomed to investing substantial resources in facul-

[10] According to the Chancellor of Arya Mehr University, of 66,000 students taking the university and college placement examination in 1971, only 10,000 could be accepted in the 13 major institutions.

ty exchange with foreign universities. Pahlavi has been devoting $500,000 a year to this purpose, a sum that formerly financed a "sister" relationship with the University of Pennsylvania.[11]

Arya Mehr University has not yet defined its needs for help from U.S. institutions, but has a consulting arrangement with Professor Gordon Brown of MIT, who has had extensive experience with the establishment of both the Birla Institute at Pilani and the Indian Institute of Technology in Kanpur, India.

Relatively little research is done in Iranian universities, and they have shown good judgment in not establishing Ph. D. programs prematurely. Their primary needs for help seem to be in (a) attracting visiting faculty in specialties in which they are initiating new programs, (b) university administrative planning and operations, (c) placement of faculty on sabbatical in the United States, and (d) library management.

In only three universities is English a medium of instruction in technical fields: Pahlavi, and parts of Tehran and Arya Mehr Universities. This is an effective limit to the usefulness of U.S. visiting teaching staff.

(4) Other Priority Items and Technical Cooperation Opportunities

Although health services have a priority similar to education, this area was not within the team's competence and remained unexamined. PlanOrg identified roads and housing as priority areas for the Fifth 5-Year Plan. In addition, the team became aware of a number of other opportunities for technical cooperation, including:

(a) Water Resources (see app. 8).—The PlanOrg has undertaken national planning for water resource development and utilization. An experienced and high-level expert is needed to guide this effort as a consultant—in effect, to provide for this sector the leadership that Walker Cisler (under A.I.D. sponsorship) brought to power development planning in 1966. This contribution to the development of Iran's national power system is regarded by the Iranians as an outstanding success story. It has been written up in some detail in appendix 9 because it warrants careful study as a model for what we should try to do in the case of other major projects for which Iran would like U.S. assistance in program definition.

The necessary cooperation between the water and agriculture Ministries will, it is expected, be promoted by the fact that the former Minister for Water and Power has now become Minister of Agriculture and Natural Resources. No request has yet been directed through U.S. Government channels for identifying the kinds of experts who would be needed. The U.S. Water Resources Council has the competence to assist in the search if called upon.

(b) City and Regional Planning (see app. 10).—The general conceptual framework of Iran's urbanization policy is established, and 11 regional

[11] The University of Pennsylvania was brought in 10 years ago, with A.I.D. financing, to assist in the transformation of a medical school in Shiraz into the present Pahlavi University. The history of this project is an excellent casebook illustration of how concessional technical assistance can mature over a period of years. However, Pahlavi still needs overseas help, though it can (and does) contribute its normal academic salary budgets and sabbatical leave funds to acquire it.

planning organizations are being developed to assist in determining desired locations for new sources of employment and defining the infrastructure requirements that this decentralization policy implies. No direct requests for help were directed to the team, but the GOI will need hundreds of competent, middle-level planning professionals, and will have to go outside Iran to satisfy the need. The Battelle Memorial Institute has a contract to provide guidelines for comparative analysis of these regional plans.

(c) Industrial Development: Management (see app. 11).—As mentioned above, the private sector typically brings in turnkey projects, with overseas parent companies providing not only production engineering but quality control and trouble-shooting as well. A sizable array[12] of U.S. technical and management consultants is in business in Tehran.

No specific requirements were identified to the team, but their existence is demonstrated by the ability of these firms to operate profitably and the fact that the International Executive Service Corps (IESC) in Iran is oversubscribed with requests from clients. The Iran IESC program comprises about 40 projects per year making it the second most active IESC country program in the world.

(d) Industrial Standardization and Adaptive Research (see app. 12).—The Institute for Standards and Industrial Research of Iran (ISIRI) with an expanding program and supplementary assistance from UNDP, has requested technical advice from the U.S. National Bureau of Standards (NBS), Department of Commerce. Their requirements are for experienced advice in establishing a metrology laboratory, assuring compliance with weights and measures laws in retail trade, and establishing quality grading standards and field test programs for improved quality control, particularly for native industry products flowing into export markets. Technical help from NBS (or from U.S. private-sector standards bodies) would help Iran to facilitate introduction of U.S. products in the Iranian market, to the extent ISIRI chooses to adopt U.S. standards.

(e) National Housing Policy (see app. 13).—The Ministry of Housing and Development is requesting help from the NBS Building Research Division to help plan a new building materials testing and evaluation laboratory (for code compliance) and to assist in training Iranian specialists in earthquake engineering as it relates to design, construction methods, and codes. The Ministry is also interested in applicability of plastic pipes and related materials in earthquake resistant designs, particularly in view of possible production of such materials from Iranian petrochemicals.

(f) Basic Research Cooperation.—Although Iran is not yet emphasizing sophisticated scientific research (no doubt wisely, and consistent with reliance on foreign universities for doctoral training), several opportunities for mutually beneficial cooperative research came to our attention. For example, Iran offers unusually favorable conditions for comparative studies of active faulting, crustal structures, and surficial geological effects associated with earthquakes—studies comparable to the governmental and university interagency program now underway in California. Other examples include a possible

[12] For example: A. D. Little, Harza Engineering, Brown & Root, S. R. I., Battelle, Page Communications, IBEC-Development & Resources Corp.

jointly funded geological investigation of an unusual group of impact craters in southeastern Iran, archeological investigations at Pahlavi University and anthropological studies conducted by the University of Tehran and the University of Illinois.

Senior members of the Iranian scientific community have approached the U.S. National Academy of Sciences for possible advice on formation of an Iranian Academy, but this issue was not discussed with the team by Iranian officials.

E. Government of Iran's Attitudes Toward Technical Cooperation with the United States

A positive attitude toward cooperation without prospect of U.S. financing was expressed by GOI Ministers, their senior executives, agency heads, and laboratory and faculty professionals.

Of 27 Cabinet Ministers, 18 were educated abroad, a large number of them in the United States. Perhaps more importantly, many senior technocrats in the Government have received doctorate level professional training in the United States, often under A.I.D. participant training programs. The largest source of support for this desire for U.S. education was not A.I.D. but was private funds of Iranian families—who today have 20,000 to 30,000 of their sons and daughters studying abroad, with American universities their first choice. Iranians recognize the value of the practical experience gained by engineering students in U.S. schools, even though they have difficulty achieving it in their own institutions. Not surprisingly, English is the primary second language of Iran, and is commonly used for general communication in Iranian science and technology at the higher levels.

We were repeatedly told that the Iranian Government generally prefers U.S. technical consultants for their technical competence and objectivity. However, the Iranians are very price conscious, as befits a people whose traditions include 2,500 years of experience as entrepreneurs. When negotiating for services of experts whose skills they cannot easily evaluate (this ability being the very service sought) they understandably tend to balk at paying twice as much for Americans as for Englishmen.

Government officials frequently remarked that their greatest need was for consultants free of commercial self-interest to assist them with the program definition phase of major development plans. In the absence of well-defined terms of reference, project feasibility studies prepared by consulting companies contribute to the bookshelf of 200 to 300 plans purchased by PlanOrg but unimplemented. "Consulting companies take 3 months to tell us what we already know" was a typical comment.

The team found that not only PlanOrg (which controls budgets for all development programs) but Ministers and even bureaus and laboratories were quite willing to pay for services rendered, provided they got high quality performance.

For technical services which are offered in terms of a fixed price for a specified job (soil surveys were an example), U.S. salary rates are less rele-

vant and U.S. firms are more competitive. But when an Iranian laboratory or university proposes to invite a professional from a similar U.S. laboratory, using funds allocated to fixed salaried positions, a real impediment to reimbursed technical cooperation arises. The Iranian salary is insufficient to meet an American's living costs in Iran and his financial obligations at home. To bridge the gap between the Iranian professional salary, and the normal income of experts visiting from the United Kingdom, the British Development Council (funded by the British Overseas Administration) pays the difference in many such cases. This practice, often called "topping off," is established in U.S. law for U.S. Government employees, but at present only for those who transfer to U.N. and other international organizations.

Another problem identified by PlanOrg, Ministers, and universities was the need for faster and more reliable means for identifying qualified and available talent in the United States to provide specific technical services.

The mechanisms now in use are discussed below. Iran is paying for these services, using a variety of methods. The major banks which provide development loans are one useful source. Iranians are in many cases quite knowledgeable about U.S. sources and contact prospective consultants directly. But cases do arise with reasonable frequency in which an inquiry through U.S. Government channels seems most appropriate. When A.I.D. had a mission and a program in Iran, this avenue was heavily relied on with considerable success for initial screening and, when possible, for direct handling of such inquiries. But now many of such inquiries must be referred through the American Embassy back to the office of reimbursable technical services in A.I.D., whose staff of four professionals is expected to serve all the non-A.I.D. developing nations. The size of this staff is no match for even one well-staffed A.I.D. field mission for such initial screening, let alone its Washington job of coordinating the answers to these inquiries.

In summary, the GOI prefers, and is prepared to pay for, technical services from the United States and values highly any opportunity for technical exchange for mutual benefit. But there are real obstacles to impede this cooperation: the modest professional sophistication of Iranian institutions, the substantial salary differential between Iran and the United States and the difficulty sometimes experienced in finding an available American who has the needed competence.

F. GOI Views of Former U.S. Bilateral Technical Assistance Program (see app. 14)

Since A.I.D. made significant investments in the Iranian professional infrastructures, one may ask: What remains of the relationships established before 1968? Do these not facilitate knowledge of U.S. capabilities? Can we estimate the likely future value of technical cooperation by examining the views of Iranian officials about the value of technical assistance in prior years?

Many senior GOI officials were unable to answer quickly—or specifically—questions about the value of earlier aid programs. Apparently these officials do not believe that A.I.D.'s contribution was a critical element in Iran's

general development but most of them were not in office in the earlier years of A.I.D.

Nevertheless, the value of participant training in the United States was universally acknowledged. Several specific programs did clearly leave a decisive mark and are broadly appreciated: the planning and management of the electric power system (modern and well run, expanding at 25% per year) and the introduction of the most sophisticated technology for poultry production (which leads Iranian housewives whose families were unaccustomed to eating poultry to ask for "American chicken" in the shops).

Yet it is entirely possible that the most important effect of A.I.D.-sponsored technical assistance may have been one that has received little recognition: the early introduction and demonstration of technologies that Iran was unable to adopt right away for institutional reasons, but which paved the way for subsequent acceptance.

In the early 1950's A.I.D. sponsored a project in modern animal husbandry. Although technically successful, it did not take root. Now the GOI is determined to invest $2 billion in this technology. What part did the earlier, modest A.I.D. project play in preparing the more imaginative Iranian leadership to adopt this idea when the time was ripe? Similar examples could be cited in other areas. A senior official of the PlanOrg summarized: "The most important legacy of A.I.D. technical assistance is intangible. It opened our eyes to new and better ways of doing things. It changed attitudes." This, of course, is the most difficult and most valuable task in any development program. It is especially important in Iran which seeks to accomplish in a decade social changes that took many centuries in Europe.

In summary, one must admit that there are two reasons for a technical assistance program leaving few visible footprints. It can have no effect at all, or it can do the job of transferring American technology and management so successfully that the host country adopts the ideas as its own and accepts them as part of the culture. Iran's rapid economic progress and the generally favorable attitude toward the United States are at least not inconsistent with the latter alternative.

Technical cooperation for which Iran pays for the value received is even more likely to have this greatly desired property, for the program is Iran's own from the outset in the sense that full managerial responsibility rests in Iranian hands. And Iran's experience with the best of U.S. technical assistance has been very good indeed. Minister of Agriculture Ruhani's evident optimism about the efficacy of U.S. help on the meat production program is based on his favorable prior experience as Minister of Power in working with U.S. technical help.

III. MECHANISMS FOR TECHNICAL COOPERATION

Thus far we have concluded (1) that it is in the U.S. interest to be responsive to Iranian proposals for technical cooperation, (2) that there are a number of worthwhile areas for cooperation, and (3) that the Government of Iran desires such cooperation. Circumstances may be favorable for success, provided certain criteria are met and the necessary investment of U.S. Government attention and—where appropriate—public funds are available.

What mechanisms are useful for such cooperation? What needs to be done to enhance that usefulness? A summary of some of the functions served by technical cooperation, illustrated in the discussion of opportunities for such cooperation, will help to identify the mechanisms appropriate to each:

A. Acquisition of Industrial Technology by Iran

The private sector normally purchases technology through joint ventures or license arrangements and is often given protection from import competition by heavy import duties and restrictions. Policies needed to enhance private-sector initiative lie outside the scope of this inquiry. The technology transfer, itself, is effective. Because the U.S. companies involved are usually multinational, the expertise and even the hardware involved are not necessarily American; they may be brought in from European subsidiaries or other non-U.S. sources.

Public-sector industrial concerns can also purchase technology and management services. When decisions are made to keep the entire structure of the enterprise in Iranian hands (as planned for the Sar Chesmeh copper), the hiring of experienced consultants becomes a critical matter indeed. U.S. banks and many other private-sector institutions may be used as channels; U.S. Government channels are less likely to be involved.

B. Assistance to High Levels of Government for Program Definition, Planning, and Management of Priority National Development Plans

This strongly felt need cannot, in the GOI view, be filled by consulting firms, but must be done by capable and influential individuals who are in a position to advise objectively. The location and recruitment of such individuals may be a major undertaking. The U.S. Government could make a

contribution here (for example, for the meat production program) if sufficiently serious attention is paid to it by appropriate agencies. However, private-sector, non-commercial channels can also be useful to the same end.

C. Program Feasibility Studies and Analysis

Iranian ministries make liberal use of private consulting firms for this purpose, and when the task has been well enough prepared and defined, the results may be quite satisfactory. However, inter-ministry relationships can greatly complicate the implementation of otherwise sound plans; a long experience in Iranian ways is an essential attribute for successful service. Thus, organizations with local experience are most likely to be successful.

D. Research Cooperation and Program Planning; Other Cooperative Relations Between Technical Institutions

The preponderance of traditional-type technical assistance that Iran is now obtaining lies in this area; national government agencies and international agencies are frequent points of contact (as well as finance). Universities, not-for-profit laboratories, and government laboratories are typical participants. U.S. experience in providing American technical expertise from such institutions indicates that bilateral or direct cooperation between a U.S. organization and one of the host country is usually more effective than institutional cooperation arranged on a multilateral basis. Aside from assuring satisfactory financial arrangements, the most critical requirement in effective cooperation in research and program planning is direct and open communications between the cooperating experts and agencies, plus continuity in the relationship. The latter may depend as much on assuring the continued interest and capability to respond by the U.S. agency as on the continued investment by the Iranian partner. The best assurance of that continuity is establishment of direct, continuing relationships between the two institutions, and between individuals with a common interest in a given discipline.

E. Institution Building for Education and Academic Research

Given adequate financing, an Iranian university seeks such assistance as it requires on its own. But lacking advanced research and doctoral and post-doctoral programs, the incentive for U.S. faculty to respond is low unless access to Iranian geography, people, or documents is essential (as in anthropology, archeology, botany, geology, etc.). To compensate for this difficulty, Iranian universities would be well advised to concentrate their research effort in a few areas where excellence is both possible and useful, and seek to establish sister relationships with one or two strong universities abroad. Pahlavi's Medical School has such a relationship with the University of

Pennsylvania's Medical School; the relationship has matured with the termination of A.I.D. assistance, being continued through a contract funded by Pahlavi. Recently, as Pahlavi's capabilities have increased, the contract has been reduced but continues at a significant level. Arya Mehr University might profitably seek a similar relationship with an institution such as MIT or California Institute of Technology.

For this relationship to be successful, the participating U.S. institution must often receive some U.S. Government support, such as that provided under Section 211(d) of the A.I.D. authorizing legislation,[13] even though the Iranian university pays salaries that are generous by Iranian standards. The "special relationship" with a U.S. university also provides access to information on placement of Iranian students and faculty on sabbatical leave in other U.S. universities.

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[13] Section 211(d) of the Foreign Assistance Act of 1961, as amended, reads: "Not to exceed $10,000,000 of funds made available . . . may be used for assistance, on such terms and conditions as the President may specify, to research and educational institutions in the United States for the purpose of strengthening their capacity to develop and carry out programs concerned with the economic and social development of less developed countries."

IV. CONCLUSIONS AND RECOMMENDATIONS

A. U.S. Government Agencies Must Follow Through on Team Visit

Conclusion

The seriousness with which the Government of Iran took the team visit suggests that the visit did achieve its intent to "Demonstrate U.S. interest in finding ways of expanding mutually beneficial technical cooperation between U.S. and Iranian institutions," as specified in the charge to the team. A number of Iranian desires were stated quite explicitly, even if not forwarded as requests through formal channels. Other desires were made obvious without being so explicitly formulated into requests. These opportunities for technical cooperation are summarized in the preceding sections of this report and are described in more detail in the Appendices.

The team found the Government of Iran strongly desirous of access to U.S. technical and professional experience, prepared to pay for assistance of high quality, and willing to use both official and private channels to get it. According to their own statements, Iranian officials prefer U.S. experts and will trust them to assist the Government with sensitive program definition for high priority development plans.

The GOI has well-established mechanisms for setting priorities and has identified a number of important opportunities for technical cooperation that call for a U.S. Government response—either to take responsibility for identifying non-governmental experts of high quality, strong motivation, and technical objectivity, or to provide experts from U.S. agencies. The prospects for success in this type of technical cooperation should be greater than in concessional aid projects because of the increased initiative and responsibility the host country must take. The team believes that benefits to U.S.-Iran relationships may result from prompt response and followup (including making available to the GOI a copy of this document). Conversely, the team believes that harm to those relationships may result from a failure to follow through, since expectations were aroused by the survey and disappointed expectations may generate negative attitudes.

Recommendation

We recommend that the Agency for International Development and the Department of State, as appropriate, give close attention to followup by

Federal agencies. Highest priority should be given to the protein production program, especially since Minister of Agriculture Ruhani has already discussed the subject with Secretary Butz during his recent visit to the United States. Specific proposals for next steps on this and other programs are contained in the Appendices of this report. A.I.D. and State should bring the importance of these programs to the attention of appropriate Department Secretaries and obtain their support for action by their Departments.

B. A Technical Cooperation Policy for Nations in All Stages of Development is Needed

Conclusion

Cooperative relations with friendly developing countries which have reached the stage of self-sustaining growth and can manage their balance of payments are of great importance to the U.S. self-interest. Such countries, of which Iran is an example, are primary sources of needed natural resources and are attractive and growing markets for our most successful export sector: fabricating machinery and similar high-technology products. As independent, private-sector oriented countries, they offer hope as cornerstones of regional development. Among such nations are Iran, Mexico, Greece, and Venezuela. The U.S. Government has well-developed policies and extensive programs of concessional technical assistance to developing nations that have not yet reached the self-sustaining stage. The U.S. Government also has extensive commercial, cultural, and even official bilateral cooperation arrangements with industrialized countries. But the lack of well-defined policies and relationships furthering technical cooperation with nations at an intermediate stage of development such as Iran is conspicuous and detracts from U.S. interests.

Recommendation

U.S. policy toward technical cooperation with nations in various stages of development must evolve as the nations themselves do. A.I.D. programs in transitional, but still A.I.D.-eligible countries such as Brazil, Korea, Turkey, and Nigeria should anticipate evolution toward continued or even enhanced cooperation based increasingly on reimbursed assistance, with greater dependence on private-sector involvement and a higher degree of host country initiative and control over programming. Recognizing that all these factors strengthen the value of such technical cooperation, an increased priority of U.S. Government attention to newly self-sustaining nations such as Iran should replace the present practice of giving them less attention than those receiving concessional aid.

C. U.S. Investments in Technical Cooperation Should Match U.S. Interests

Conclusion

Even though a nation may have reached the stage of self-sustaining development, it does not follow that technical assistance is no longer required. Indeed, as personal incomes mount and popular expectations rise, and as the economy begins to demand a more complex pattern of industrial infrastructure, the need for some types of technical help grows. The scarcity of facilities for training and the consequent deficiencies of middle-management experience and engineering, technical, and service skills being experienced by Iran is a symptom of this stage of rapid industrial development. As a result, the pattern of industrialization and thus of commercial relationships is necessarily heavily influenced by foreign trained Iranians and by foreign talent imported to fill the gap.

The U.S. commercial sector must compete in selling technical services in Iran without U.S. subsidy. But the public benefits associated with strengthened U.S. commercial, as well as scientific and international, relations with Iran justify the U.S. Government's financing the supporting service and other costs necessary to ensure that Iran and similar countries are aware of, and have access to, U.S. public and private institutional capabilities on a reimbursable basis, and that these institutions maintain their competence to respond. To the extent that more tangible U.S. self-interest in technical cooperation can be demonstrated, the use of U.S. public funds to share the cost of technical cooperation is justified. Such investments should not be regarded as "aid," any more than Department of Commerce sponsored trade fairs are "aid." The criteria for determining U.S. self-interest, however, should be searching and stringent. The bars to concessional aid should not be let down merely to ensure that U.S. expertise can compete on a price basis with that of other developed countries. For the most part we should expect U.S. expertise to compete on the basis of demonstrated superior quality and unique capability.

Recommendation

The policy on cost sharing of technical cooperation with any developing country should be flexible and related to the nature of the specific and adequately justified U.S. self-interest involved and to the needs and capabilities of the host country. The division of responsibility for financing technical cooperation should reflect the relative extent of the national interests of the United States and the host country, as well as the availability of resources. Increasing fractions of the country's technical assistance needs can be expected to be furnished by the private sector as development proceeds. But the growing political and commercial importance of the relationship to the United States as a whole justifies investments by the U.S. Government to foster our ability to help the host country to identify and get access to responsive U.S. technical services.

D. A.I.D. Shares Responsibility with the Private Sector in a Pluralistic Environment for Cooperation

Conclusion

A pluralistic approach to mechanisms for cooperation is appropriate in the case of Iran. U.S.-based private-sector management, scientific, and engineering consultants are well established in Tehran. Through banks and other contacts, Iranian officials have broad access to U.S. commercial capabilities. Opportunities were identified for individual experts to assist in strengthening Iranian technical institutions and planning Iranian development programs by serving as visiting consultants, researchers, and lecturers at the invitation and expense of Iran. Thus, the private sector has a major independent role, entirely outside governmental channels.

Although a properly staffed office of reimbursable technical services in A.I.D. can be helpful in assisting the Government of Iran to locate qualified persons, we are impressed by the extensive Iranian professional contacts with the United States, deriving largely from prior educational experience here of both governmental and commercial leaders. Bilateral institutional relationships can be very useful in locating qualified persons. High-level attention by the Government of the United States should not be necessary in such cases once institutional relationships are established. Priorities are a matter for the Iranians; in the absence of concessional aid the magnitude of requests for expert assistance will require priority choices to be made in the allocation of resources.

However, a major role remains for U.S. Government agencies, particularly A.I.D. When the Government of Iran at Ministerial level requests professional help from experienced Americans with the planning and management of major national development schemes that are of critical economic and political importance to Iran, a U.S. investment of time and attention by high-level officials is called for.

Recommendation

The most important responsibility of A.I.D. in its role as a channel for requests for reimbursable technical services is to ensure, in cooperation with the Department of State and qualified Federal agencies, that the nature of the U.S. interest is properly identified, that priorities for the U.S. Government's attention at high levels are set, and that the response of the agencies is not only timely but of a quality appropriate to the circumstances. Given the number of country relationships for which this recommendation is appropriate, we suspect that only a few projects in Iran can receive this level of attention. Clearly the protein production program, top priority in the Iranian Fifth 5-Year Plan, is such a project. Official U.S. involvement, even to the extent of helping locate private-sector consultants, should be avoided unless the U.S. Government agencies participating are willing to ensure in some fashion the appropriateness and quality of the technical resources recom-

mended to the Government of Iran. Just as such involvement can redound to U.S. political and commercial benefit, it can, in the event of program failure, equally well injure U.S. interests in both spheres. We wish to emphasize this point because it is so often overlooked in the concentration of attention on the issue of whether or not a program of technical cooperation should be partly financed by U.S. funds.

E. A.I.D., Other Federal Agencies, and Private Institutions Must Develop and Pool Their Resources and Capabilities

Conclusion

To further U.S. interests in connection with technical cooperation opportunities in Iran, and similar rapidly developing countries, mechanisms and investments are needed to provide for (1) identification and evaluation by A.I.D. of these requests that come through official U.S. Government channels, (2) continued assessment by A.I.D. and State of the effectiveness of the panoply of technical cooperation arrangements both public and private in furthering national policy objectives, (3) strengthening of continuing U.S.-Iran institutional relationships as the best mechanism for fostering reimbursable cooperation.

The first two functions call for close cooperation between A.I.D., State, and other major Federal agencies with technical experience and capability to contribute. If A.I.D. is to have program coordinating responsibility for U.S. Government technical cooperation efforts in developing countries like Iran, A.I.D.'s internal mechanism for relating to such countries must reflect the priorities and realities of the situation. It must be able to identify and evaluate opportunities that could have major political and economic significance and ensure that these are dealt with at the necessary level of technical and political sophistication.

At the same time, A.I.D. must recognize that in most cases Iranian access to U.S. technical capabilities will be sought outside official Government channels, and that this should be regarded not only as desirable but as a goal to be actively sought. As Iranian institutions become more accustomed to sophisticated commercial responsiveness, they will come to expect a corresponding degree of sophistication and responsiveness in A.I.D.'s mechanism for channeling such requests. Thus, we view as totally inadequate and inappropriate any narrow image of the office of reimbursable technical services as a letter drop for passively forwarding requests for assistance to indifferent agencies or for pulling names of experts off computerized lists. An active and demanding policy and program responsibility cannot be avoided if the job is to be done properly, and adequate resources must be provided for this purpose.

Recommendation

We recommend that the A.I.D. Administrator and the Secretary of State assess the priority to be accorded an effective response to technical cooperation opportunities in Iran and similarly situated nations. If they agree with our judgment that this priority should favorably compete with the priority accorded nations receiving concessional assistance, and further confirm that A.I.D. has the lead agency responsibility, then we recommend that A.I.D. be organized to do the job. Among the capabilities needed are:

(1) Resources (a) to mobilize survey teams in special cases to make country assessments of the status of cooperation activities and opportunities, and (b) to follow these up with teams of selected experts to pursue particularly important opportunities in sufficient depth to determine quickly whether they merit a high-level effort by the United States. The costs of such teams might be borne by the United States in some cases. Serious discussions of reimbursable assistance on the basis of a realistic and technically qualified judgment can then be rapidly initiated with the host country. In cooperation with a capable embassy staff in the host country, such survey teams can serve—perhaps better in some cases—the pre-program evaluation function of the resident A.I.D. mission in A.I.D.-eligible countries.

(2) A clear congressional charter for A.I.D. to sustain the interests and capabilities of a spectrum of non-commercial U.S. institutions on which bilateral institutional relationships with Iran and similar countries depend. We are convinced that such relationships are essential links in technical cooperation. U.S. academic institutions need help especially, because of the need to combine resources of both countries to finance exchanges of faculty and research personnel. While we do not recommend a policy of "topping off," to the extent that concept implies a formula for subsidization with public funds of the difference between Iranian and U.S. salaries, we do urge that selected U.S. institutions that have demonstrated a commitment to effective cooperation be given sufficient resources to make jointly sponsored exchanges possible. The concept of Section 211(d) of the Foreign Assistance Act is just what is needed, but its limitation, explicit or implicit, to A.I.D.-eligible countries should be removed. The funding under this program should be substantially expanded, and A.I.D. should be prepared to evaluate periodically the contributions to U.S. interests that have resulted from these U.S. institutional investments.

(3) Resources, backed up by recognition at highest agency levels of the importance of the program, to ensure that U.S. Federal agencies can and will respond to priority reimbursed assistance opportunities in a manner consistent with considerations of foreign policy objectives. Responsibility for seeking appropriated funds to strengthen agency capabilities to respond should remain with the agencies themselves to the extent they can justify it legislatively as a contribution to the accomplishment of their own special missions. But where the benefits of responding to technical cooperation requests lie generally with the U.S.

political and commercial goals, A.I.D. must seek the needed funds. A.I.D. should seek appropriations to ensure that selected agencies can draw on their existing resources effectively to support A.I.D.'s objectives, coordinate technical cooperation activities with related efforts, and ensure that the agency's experience in such activities is cumulative and contributes to its future capability to respond. Thus decision-making on the application of criteria for U.S. cost-sharing in technical cooperation with countries like Iran should be decentralized to some degree.

(4) An interagency consultative mechanism to further U.S. technical cooperation activities. This mechanism would serve as a clearinghouse for information and action to strengthen such activities. It would identify matters of concern to two or more Federal agencies, develop measures for increasing agency effectiveness in dealing with them, bring these measures to the attention of agency officials at appropriate levels for necessary action, and coordinate such action. Most Federal agencies have offices concerned with international affairs. Many of them have impressive records of accomplishment. We recommend that consideration be given to assembling a working group of representatives of such offices under the chairmanship of A.I.D., and perhaps under the aegis of the Federal Council for Science and Technology, to give further consideration to practical policies to improve the effectiveness of the agencies in international technical cooperation. The extent of each agency's commitment to such cooperation, and the desire of A.I.D. to sustain interest financially should be clearly documented.

F. The Proposed International Development Institute (IDI) Would Embody the Resources and Capabilities Needed for this Technical Cooperation Function

Conclusion

If a U.S. institution is to coordinate, stimulate, and ascertain needs of a technical cooperation program under the policies recommended here, in which the criteria for selection of cooperating countries and for determining the nature of cost-sharing are flexibly related to considerations of U.S. national interest while simultaneously being derivative of host country initiative and funding, the organization and mission of the proposed IDI seems appropriate. The competence and experience available to A.I.D. for responding to requests from Iran and similar countries requires not only access to the most experienced people in A.I.D., but links to institutions in the private sector with continuing international involvement. The activities we envision do not bear a direct relationship to A.I.D. capital assistance programs and need not be in the same organization.

Recommendation

Since many of our recommendations seem to parallel capabilities proposed for the International Development Institute, we recommend that U.S. relationships with self-sustaining, developing countries be considered an important additional justification for the formation of IDI. However, we believe that first steps toward establishing the required capabilities for technical cooperation with nations in the status of Iran can be taken in A.I.D., without waiting for IDI.

G. Bilateral Cooperation Agreement

Conclusion

It is unclear to us what role the U.S.-Iran bilateral science cooperation agreement now being negotiated would play in future technical cooperation. We received varying views from Iran Government officials on the relation of such an agreement to their requests for reimbursed assistance from the United States through official channels. There is considerable need for clarification on both the Iranian and U.S. side, about the scope and purpose of such an agreement. Would the scope cover the full spectrum of technical activities dealt with in this report or only research cooperation? What would the division of responsibility be among the Ministries for administering such an agreement in view of their assigned functions?

Finally, we should note that research generally, and scientific research in particular, is in a relatively early stage of development in Iran. Building this capability does not seem to have high priority, and the decision to proceed cautiously (which the team endorses) in introducing Ph. D. programs in the universities militates against rapid development of academic pressures for research. A research cooperation agreement specifically for the purpose of fostering Iran's research capabilities in selected fields might be a useful instrument for helping the National Science Foundation to match interests of U.S. universities and other research institutions to the corresponding Iranian interests, and protecting the latter from bureaucratic pressure.

Recommendation

We recommend that the Department of State clarify through consultation with other concerned agencies exactly what the scope of the U.S.-Iran bilateral agreement should be—whether it covers only scientific research and academic interchange, in which case NSF should be the lead agency in the United States—or covers the provision of technical and managerial services broadly, in which case A.I.D. might be the more appropriate lead agency in the United States. Similarly, the choice of lead agency selected by the Government of Iran might depend upon the scope of the agreement.

Appendix 1

Members of Study Team

Dr. Lewis M. Branscomb* (Team Leader)

Director, National Bureau of Standards
U.S. Department of Commerce

While a member (1964-68) of the President's Science Advisory Committee (PSAC), he participated in the PSAC International Technical Cooperation and Assistance Panel and the Panel's survey of technical assistance policies in Pakistan and India. The Panel's report to the President was strongly paralleled by the Peterson Report, which led to proposals for reorganization of A.I.D. technical assistance activities in an International Development Institute (IDI). He served (January 1970) as a member of the National Security Council's subcommittee to draft the terms of reference for legislation to establish the IDI. Other international experience is in basic sciences (action member of three international scientific unions), in international standardization (U.S. delegate to General Conference, Weights and Measures), and in science and technology policy for economic development (consultant to Secretary General, OECD, 1968-70; Deputy Chief U.S. Delegation, UNESCO Intergovernmental Conference on UNISIST, October 1971.)

Dr. Edward L. Brady

Associate Director for Information Programs
National Bureau of Standards

Has served two assignments overseas—one in London as the Scientific Representative of the U.S. Atomic Energy Commission and the other as the Scientific Adviser of the U.S. Mission to the International Atomic Energy Agency (IAEA), stationed in Vienna, Austria. In 1962 he served as a member of the committee to advise the Department of State on U.S. policy toward the International Atomic Energy Agency and in 1971 served as Staff Director of a State Department study to evaluate the effectiveness of the IAEA and to reassess U.S. policy. As Associate Director of the National Bureau of Standards for Information Programs he has participated in committee activities of the OECD Information Policy Group and of the Committee on Data for Science and Technology of the International Council of Scientific

* Present address: Vice President, International Business Machines, Armonk, New York.

Unions. His present position includes general supervision of the international relations activities of the National Bureau of Standards.

Dr. William S. Butcher

Technical Assistant for Water Resources to the President's Science Adviser

Has given special attention to policy problems in water resources including the role of desalting in U.S. national water policy, water pollution control, and long-range planning of water resources research. He has served as Chairman, Committee on Water Resources Research of the Federal Council for Science and Technology which is responsible for guiding and coordinating the U.S. Government's water resource and research activity; has engaged in teaching, research, and research administration in water resources planning and management in Australia, California, Nevada, and Texas; and is author of numerous articles on water resources.

Dr. Maurice D. Kilbridge

Dean, Graduate School of Design
Harvard University

Has a varied and rich background in industrial development and urbanization. He served as a member of the Harvard Advisory Mission to the Planning Board of the Government of Pakistan from 1954 to 1956 and as Assistant Director of the U.S. A.I.D. Mission to India from 1963 to 1965. In the course of his professional work he has participated in studies of such diverse regions as the south of France and the River Platt Basin. In addition to teaching urban planning at the Graduate School of Design, he has taught at both the Harvard and the University of Chicago Business Schools in the fields of industrial management and operations research. His most recent book, *Urban Analysis*, applies analytical techniques to urban planning.

Dr. Albert H. Moseman

Associate, Agricultural Development Council
New York

Has been Chief of the Bureau of Plant Industry, and Director of Crops Research in the U.S. Department of Agriculture. As Director of Agricultural Sciences for the Rockefeller Foundation, and A.I.D. Assistant Administrator for Technical Cooperation and Research, has traveled widely in Africa, Latin America, Asia, Europe and the Near East to confer with government officials on technical cooperation programs. Currently serving as Adviser to Malaysian Agricultural Research Development Institute.

Dr. John A. Reinemund

Chief, Office of International Geology
U.S. Geological Survey
U.S. Department of the Interior

Has been Chief of the U.S. Geological Survey Office of International Geology and in charge of the Survey's international geological and mineral programs since 1964. These programs involve 75 to 100 earth scientists on foreign work in about 15 countries, on the average. From 1956 to 1964 he was Senior Geologic Consultant to the Government of Pakistan and Chief of the Survey's 30-man staff assisting the Geological Survey of Pakistan. His first work abroad was on a coal survey project in Korea in 1949. He has served nearly 30 years with the USGS, and his experience includes work in mineral resources, fuel resources, oceanography, structure, and sedimentation.

Dr. Ernest R. Sohns

Acting Director, Office of International Programs
National Science Foundation

Studied research and development programs in the natural and physical sciences among the European countries; participated in symposia on science and technology in developing countries; assisted in the negotiation of technical service agreements in South Asia and the Middle East (Israel, Pakistan and India); and has taken part in country surveys, most recently in Chile.

Honorable C. Tyler Wood

Consultant, Agency for International Development

After a career in investment banking, and service with the War Production Board and the Army Service Forces during World War II, began connection with foreign assistance in 1945 as Officer in Charge for the Department of State of the U.S. interest in the United Nations Relief and Rehabilitation Administration (UNRRA). During the period 1945-48 took part in planning for the Marshall Plan. In 1948 joined Paul Hoffman in the Marshall Plan Organization (ECA) and has served with the various U.S. foreign aid agencies since that time. Service abroad has been in Paris during the Marshall Plan period (as second in command in the European Office of ECA); in Korea (1953-56) in charge of U.S. aid in the reconstruction program there after the war; in India (1959-63) as Economic Minister and Director of the U.S. aid program. Retired in 1970 and serves as Consultant to Administrator of A.I.D.

Dr. Hyde G. Buller (Executive Secretary)

Chief, Reimbursable Technical Services
Technical Assistance Bureau
Agency for International Development

Has been engaged in overseas development activities for more than 20 years as: Associate Director for Supply Coordination for the Board of Trustees for Rehabilitation Affairs in China; managing director of consulting firm; Assistant Director for Agricultural and Natural Resource Development, Institute of Inter-American Affairs; Assistant Director for Program in the U.S. aid mission to India; A.I.D. Area Operations Officer in Tanganyika; Director, Development Resources Referral Service in A.I.D. Was chairman of working group on technical cooperation for interagency Council on International Educational and Cultural Affairs; and member of task force preparing report to A.I.D. Administrator on "Proposals for Strengthening Technical Relationships With Non-A.I.D. Developing Countries."

Appendix 2

Persons With Whom Study Team Met

Mr. Ahmadi, Iranian Delegate to UNISIST

Dr. Ahmad Ali Ahmadi, Under Secretary for Parliamentary Affairs, Ministry of Natural Resources

Dr. Akbary, Ministry of Science and Higher Education

Mr. Jafar Akhavan, Sherkate Sahami Jeep

H. E. Assadollah Alam, Minister of the Imperial Court

Dr. John T. Alexander, Hawaiian Agronomics Co.

Mr. K. Alipour, Director, Technical Services Department, Geological Survey of Iran, Ministry of Economy

Mr. Hossein Alizadeh, Director General, Institute of Standards & Industrial Research of Iran, Ministry of Economy

Mr. Mozafar Ameri, Head, Department of Power and Fuels, Plan Organization

Dr. Amin, Chancellor, Arya Mehr University

Eng. Hosein Amin-Madani, Director-General, Plant Protection, Ministry of Agriculture

Eng. Amir-Hosein Amir-Parviz, Under Secretary of Agriculture for Executive Affairs, Ministry of Agriculture

Mr. A. H. Amir-Saleh, Pars Cotton Ginning & Oil Mill Corp.

Dr. Amirshahi, former Head, Department of Agronomy and Horticulture and present Deputy Project Manager of Regional Pulse Improvement Project (RPIP)

H. E. Kuros Amuzegar, Minister of Housing and Development

Mr. Michael Antar, Tenneco Iran, Inc.

Mr. Fereidor Ardalan, Director-General for International Affairs, Ministry of Science and Higher Education

Mr. E. Arjomand, Shoeleh-Khavar Co., Ltd.

Dr. M. Q. Arshadi, Director-General, Veterinary Department, Ministry of Agriculture

Dr. Ashfar, Director, Institute of Geophysics, University of Tehran

Dr. Ashrafi, Vice Chancellor for Research, University of Tehran

Dr. Saad Assad, Hawaiian Agronomics Co.

Mr. Ahmad Bacanian, Mining, Ministry of Economy

Dr. Badaksha, National Iranian Oil Corp.

Mr. Goshtasb Bakhtian, American Embassy, Commercial Section

Mr. Lloyd Bartman, Jupiter Trading Co.

Mr. Moshe Bassin, Telecom, Ltd.

Dr. Ahmad Batanian, Department of Power & Fuels, Plan Organization

Mr. Abdol Rasul Bakhtiar-Bakhtiari, Deputy Managing Director for International Cooperation, Plan Organization

Mr. Bahmad Batmanghelich, Chairman, Batiman Construction Co., (Associated with Lummus Co., Bloomfield, N.J.)

Dr. Mohammad Bagher Bayat, Under Secretary for Planning and Projects, Ministry of Natural Resources

Mr. Ian Baxter, Ingersoll Rand, Inc.

Mr. Enayat Behbahani, General Mechanic Engineering Co.

Mr. H. Behbahani, General Industrial Co.

Mr. Clifford Benedict, Fluor Co.

Mr. Lloyd Bertman, Jupiter Trading Co.

Mr. James Bockman, Consortium

Mr. Alexander B. Brewster, Gillette Co.

Dr. Charles Brinkerhoff, retired Chairman of Board of Anaconda Copper Co.

Dr. Gordon Brown, MIT, (consultant to Arya Mehr University)

Mr. A. G. Bseirani, Carrier Overseas Corp.

Dr. Cacouris, United Nations, Resident Representative's Office

Mr. T. Callaway, Director, Division of Technology and Documentation, Department of Housing and Urban Development

Mr. Curt Carlsson, Bank of America Representative

Mr. H. R. Carpenter, Managing Director, General Tire & Rubber Co.

Mr. William Cavness, McDonnell Douglas Corp.

Dr. D. Challinor, Assistant Secretary for Science,
The Smithsonian Institution

Mr. T. W. Childs, State Department, Bureau of Near Eastern and South Asian Affairs (Iran country political officer)

Mr. Daniel Cochran, American Embassy-Consulate

Mr. Bernard Colley, Continental Oil Co.

Mr. R. B. Costello, Kellogg Iran, Inc.

Dr. Zen Davidian, Vice Chancellor for International Relations, University of Isfahan

Mr. D. F. Davidson, U.S. Geological Survey, Department of Interior

Mr. Lawrence DelRay, Director, Iran-American Society, Isfahan

Mr. B. D'Escapo, Project Manager, Stanford Research Institute

Mr. Paul DeWoody, Dresser Magcobar

Mr. Norman Dietzel, Lavan Petroleum Co.

Mr. E. Dillon, President, Electric Storage Battery, Inc.

Mr. D. Dooley, Executive Director, Near East Foundation

Mr. R. L. Dowell, Jr., State Department, Bureau of Near Eastern and South Asian Affairs (Iran country economic officer)

Dr. Davachi, Dean of Karaj Agricultural College

Mr. M. A. Ebtehaj, Iranians' Bank

Mr. Habib Elghanian, Plasco Kar Co.

Mr. Ali Ellini, Assistant to Agricultural Attache, American Embassy

Mr. George A. Ellsworth, Commercial Attache, American Embassy

Mr. Lawrence J. Ervin, Iran Country Office, Peace Corps

Dr. Bijan Esfrandiari, Geology Department, University of Tehran

Dr. E. Esfrandiari, Director, Plant Pest Control Institute, Ministry of Agriculture

Dr. Estala, University of Tehran

Dr. Akbar Etamad, Director, Institute for Research and Planning in Science and Education (IRPSE), Ministry of Science and Higher Education

Mr. Khodadad Farmanfarmaian, Managing Director, Plan Organization

Dr. M. Ferdows, Director, Livestock Organization, Ministry of Agriculture

Mr. W. L. Finger, Vice President, Mid-East/African Section, International Executive Service Corps

Mr. Frank Fisher, Foremost McKesson, Inc. (Pak Dairy Co.)

Mr. Harold Fisher, Battelle Memorial Institute

Eng. A. Firooz-Mahdavi, Director, Soils and Soil Fertility Institute, Ministry of Agriculture

Mr. John Formel, B. F. Goodrich Co.

Mr. Robert Froude, Westinghouse Electric Co.

Mr. J. C. Fry, Technical Assistance Bureau, Office of Science and Technology, A.I.D.

Mr. Vincent Fuller, Price Waterhouse & Co.

Mr. Robert Gaillard, Bristol Myers (Iran) S.A.

Mr. Ismail Ghobadi, Commercial Section, American Embassy

Mr. Wayne F. Gledhill, Assistant Cultural Affairs Officer, USIA, American Embassy

Mr. A. B. Gozzard, Xerox Corp.

Dr. Gudarzi, University of Tehran

Mr. Reza Hakimzadeh, Chahr-Rahe College

Mr. Roman Halla, Industries Officer, American Embassy

Mr. Jack Hamilton, Page Communications

Mr. David I. Hanna, Vice President, Booz, Allen & Hamilton International

Mr. J. R. Hansen, IBRD, Economics Department

Mr. Kenneth Hansen, President, Doxiadis Associates, Inc.

Dr. Davoud Hariri, Director-General for Research, Ministry of Water & Power

Dr. Rafi Hariri, Deputy Director, Technical Affairs, Institute of Standards and Industrial Research of Iran, Ministry of Economy

Mr. Richard Hart, Detroit Edison

The Honorable Douglas Heck, DCM, American Embassy

Mr. Parviz Hekmat, Head, Department of Irrigation and Dams, Plan Organization

Mr. Charles D. Hood, General Electric Co.

Mr. Paul Hovenstein, Philco-Ford Corp.

Mr. Hovsep Hovsepian, T.C.C. Commercial Trading Co.

Mr. R. L. Hullinger, Reading and Bates Offshore Drilling Co.

Mr. William W. Hunt, Morrison-Knudsen International Co.

Mr. R. A. Hutchison, Lummus Co.

Dr. Assad Iranpanah, Geology Department, University of Tehran

Mr. A. Jalinoos, Shabrang Co.

Dr. Mohammad Hossain Jazirai, Technical Under Secretary for Forests, Pastures & Soil, Ministry of Natural Resources

Mr. Roger Joint, International Telephone & Telegraph

Mr. Kahkesahan, Under Secretary for Water, Ministry of Water & Power

Mr. Mohammed Kamaly, Department of Agriculture & Livestock, Plan Organization

Mr. David Bendavud Kashani, Commercial Section, American Embassy

Eng. Kaveh, Head of Wheat Research, Ministry of Agriculture

Dr. Morteza Kaveh, Director, Razi Institute, Ministry of Agriculture

H. E. Hosein Kazemzadeh, Minister, Science and Higher Education

Mr. Kent Keehn, Pfizer International, Inc.

Mr. John Kennedy, Bank of America

Mr. R. Kettaneh, Auto Tehran, S. A.

Mr. A. Khabiri, Iran Techno Corp.

Mr. Zabihollah Khabiri, Head, Department of Urban Development, Plan Organization

Dr. Nasrollah Khadem, M. aging Director, Geological Survey of Iran, Ministry of Economy

Mr. Mohammad Khosrowshahi, Pamir Co., Ltd.

Dr. Mohammad Kia, Director-General, International Relations, Ministry of Agriculture

Mr. Kiafar, Assistant Managing Director, Industrial Management Institute

Mr. Norman Kier, Singer Traffic Controls

Mr. Jeffrey Kitchen, Northrop Corp.

Mr. Walter F. Klement, Caterpillar Tractor Co.

Eng. M. Komeilizadeh, Ministry of Natural Resources

Mr. Jacob Koster, Iranians' Bank

Mr. William W. Lehfeldt, Economic Counsellor, American Embassy

Mr. Ryan L. Lenox, Economic Section, American Embassy

Mr. Gerald M. Levin, Vice President, Development & Resources Corp., IBEC Regional Representative

Mr. E. Russell Linch, Cultural Affairs Officer and Chairman of U.S. Commission for Education and Cultural Exchange with Iran, USIA, American Embassy

Mr. Lou Lindsay, Pan American (Iran Air)

Col. G. H. Maasoomi, Under Secretary for Parliamentary Affairs, Ministry of Agriculture

The Honorable Douglas MacArthur II, American Ambassador

Mr. M. J. MacMahon, International Statistics Program, Bureau of the Census, Department of Commerce

Mr. Ali Akbar Mahluji, Aftab-Shargh Technical & Trading Co.

Mr. J. K. Mansfield, Bureau of International Scientific & Technological Affairs, State Department

Mr. Charles A. Mast, Commercial Officer, American Embassy

Mr. E. C. McCullough, INTS Project

Mr. Thomas Mead, Development and Resources Corp.

Dr. Parivz Mehdizadeh, Director, Research Institute of Natural Resources, Ministry of Natural Resources

Dr. Farhang Mehr, Chancellor, Pahlavi University

Mr. S. J. Milton, Civil Aviation Attache, American Embassy

Mr. M. Mirdamad, Cavcar Co.

Mr. Hossein Mindamadi, Iran Kaveh Producing Co.

Eng. Hosein Mir-Heidar, Under Secretary for Research Affairs, Ministry of Agriculture

Dr. Fereidoun Mobasheri, Department of Irrigation and Dams, Plan Organization

Dr. Mofidi, Tehran University, Vice Chancellor for Research and Graduate Studies

Mr. Qolam-Reza Moghadam, Principal Deputy Managing Director, Plan Organization

Mr. Al Moir, Pan American World Airways

Mr. J. Momtazi, Sherkate Sahami Jeep

Mr. Marcel Montagnier, Esso Africa, Inc.

Mr. Jack Montgomery, AMOCO

Mr. Monzari, Small Handicrafts Industrial Center, Ministry of Economy

Eng. M. A. Mostafavi-Rajali, Director, Agricultural Economics, Ministry of Agriculture

Eng. K. Musavi, Director-General, Agricultural Extension, Ministry of Agriculture

Mr. Robert E. Morse, J. I. Case Co.

Mr. Byron B. Morton, Jr., Science Attache, American Embassy

Mr. Siamak Mossadeqi, Director-General, Surveys and Planning, Ministry of Natural Resources

Mr. M. H. Nabavi, Deputy Director, Geological Department, Ministry of Economy

Dr. Hushang Nahavandi, Chancellor, University of Tehran

Mrs. Effat Manatellah Nahvi, Head, Office of International Technical Cooperation, Plan Organization

Dr. Rouhani Nejad, Director, Nuclear Center, University of Tehran

Mr. Reza Nematollahi, Plan Organization

Mr. N. Neureiter, Executive Office of the President, Office of Science and Technology

Mr. Robert A. Newbill, General Manager, Dames and Moore International (Consulting Engineers)

Mr. Ahmad-Ali Noban, Head, Department of Industries & Mines, Plan Organization

Mr. Nozeri, Ministry of Economy

Mr. Dariush Oskui, Deputy Managing Director for Projects and Plans, Plan Organization

Mr. Khosro Pakdaman, Under Secretary for Planning and Research, Ministry of Housing and Development

Eng. Morad Panapour, Modjm Co.

Mr. E. H. Phinney, RTV

Mr. Isaac Pirnazar, Commercial Section, American Embassy

Mr. Younger Pitts, Northrop International

Mr. Mohamad-Taqui Pur-Abbas, Head, Research Bureau, Plan Organization

Mrs. Rad, Executive Secretary, U.S. Commission for Education and Cultural Exchange with Iran

Mr. Radfpay, Deputy Managing Director, Technical and Supervision, Plan Organization

Mr. Ali-Raza Rastegar, Managing Director, Simiran Co., (Societe Industrielle & Miniere Iranienne, S.A.)

Mr. Alexander L. Rattray, Economic Development Officer, American Embassy

Mr. Abdolrazaq Razaqi, Head, Department of Agriculture and Livestock, Plan Organization

Mr. Abdul Abbas Razban, Commercial Section, American Embassy

Mr. Clay Rhinehart, B. F. Goodrich, Iran

Dr. Riahi, Arya Mehr University

Mr. Robert Robie, Atlantic Richfield Co.

Mr. R. R. Ronkin, Staff Associate, National Science Foundation

Mr. Royce, Director, Iran-American Society, Shiraz

Mr. John Ruddy, Philco-Ford Overseas Services

H. E. Mansur Ruhani, Minister of Agriculture and in charge of the Ministry of Natural Resources

Mr. H. Sabet, Auto-Nour Co.

Mr. Hormoz Sabet, Firooz Corp.

Mr. I. Sabet, Firooz Corp.

Mr. J. M. Saghi, Owner, Nowzohour Paper Mfg. Co.

Mr. Daniel D. Sahakian, Sasan Co., Ltd. (Canada Dry)

Mr. Y. Sahim, Irano-Anglo Commercial Co., Ltd.

Mr. Nader Saleh, M.G.S. Co.

Dr. Saliehi, Assistant, Department of Urban Development, Plan Organization

Dr. H. Salimi, Director, Animal Husbandry Research Institute, Karaj

Mr. Glenn Sampson, Economic Research Service, U.S. Department of Agriculture

Mr. Mehdi Sarram, Nuclear Center, University of Tehran

Mr. Warren C. Sawyer, Country Director, Peace Corps

Mr. A. R. Schofield, Arthur D. Little Co.

Mr. Robert Schott, Iranians' Bank

Mr. Norman Scott, USIA, American Embassy

Eng. H. Sepehri, Under Secretary for Planning, Ministry of Agriculture

Dr. Shahab, National Iranian Oil Corp.

Mr. Nissim Shallon, U.N. Resident Representative

Mr. William S. Shashoua, Shabdiz Co. (Ford)

Eng. Shaydai, Ministry of Natural Resources

Eng. H. Sheibani, Director, Seed & Plant Improvement Institute, Ministry of Agriculture

Mr. E. W. Sheridan, General Tire International

Dr. Donald Simon, Battelle Memorial Institute

Dr. Sinai, Director, Iran Documentation Center, Ministry of Science and Higher Education

Dr. Smith, CENTO Scientific Coordinator

Mr. Michel F. Smith, Assistant Commercial Attache, American Embassy

Mr. E. H. Springer, Consulate, American Embassy

Mr. C. S. Stephanides, Agricultural Attache, American Embassy

Dr. Stocklin, U.N. Consultant on geologic mapping

Dr. Sulliman, University of Tehran

Mr. John Sutherland, RCA Corp.

Mr. M. Taheri, Managing Director, Philver Mfg. Co.

Mr. Khalil Taleghani, B. F. Goodrich Co.

Mr. Anthony Tedesco, Westinghouse Electric Corp.

Mr. Edward Tennant, Auditor General, A.I.D.

Dr. Teraz, Senior Research Adviser, Geological Survey, Ministry of Economy

Mr. E. Tomlinson, Oil Consortium

Mr. George Trimble, Oil Consortium

Dr. Tuba, University of Tehran

Mr. Brady V. Tunnell, AMOCO International Oil Co.

Mr. James Twombly, Page Communications

Mr. Issac Ussery, Brown & Root, Inc.

Dr. Javad Vafa, Under Secretary for International Affairs, Ministry of Economy

Mr. Soleiman Vahabzadeh, Machinhaye Rahsazi Co., Ltd.

Mr. Ahmad Vahabzedh, Machinhaye Rahsazi Co., Ltd.

Dr. Manuchehr Vahidi, Bureau of Regional Development, Plan Organization

Mr. M. F. von Voightlander, Project Manager, Harza Engineering Co.

Mr. Morteza Vakilzadeh, Director, Ghazvin Development Project, Ministry of Agriculture

Mr. Ahmad Vatanian, Department of Power & Fuels, Plan Organization

Mr. R. Warburton, Department of Housing and Urban Development

Mr. John L. Washburn, Petroleum Officer, American Embassy

Mr. Bruce Wendner, Managing Director, Geoconsultants Co.

Mr. John Westberg, John Westberg & Associates

Mr. D. B. Wilkie, Iran Pan American Oil Co.

Mr. Robert Wilkin, B. F. Goodrich Co.

Mr. M. W. Wilson, Halliburton Services

Mr. Harold Work, (former adviser to Institute of Standards and Industrial Research of Iran)

Mr. William Worsley, Director of International Executive Service Corps in Iran

Dr. R. Wright, Building Research Division, National Bureau of Standards, Department of Commerce

Dr. Davoud Zadeh, Chief, Coordination Section, Geological Survey of Iran, Ministry of Economy

Mr. Zahedi, Under Secretary and Inspector for Universities & Educational Institutions, Ministry of Science and Higher Education

Mr. H. Zargarpour, Sholeh-Khavar Co., Ltd.

Mr. Kambiz Zarrabi, Director-General for Allotment of Mines, Ministry of Economy

Dr. Zasghamee, Arya Mehr University

Mr. Kenneth Zitzman, TAI (Melpar)

Appendix 3

U.S. Interest in Iran's Development

Memorandum from A. R. Rattray, Economic Development Officer
American Embassy, Tehran, 2-18-72

Iran is a developing nation in the throes of pervasive economic and social change. At present it is one of the world's largest exporters of crude oil and the site of some 13% of the free world's proven oil resources. Petroleum provides Iran with the revenues required for extensive investment in economic and social infrastructure and the maintenance of a modern, middle-class oriented, industrial complex which has focussed on the production of consumer goods. Rural Iran encompasses some 60% of the population and is primarily engaged in traditional agriculture, mainly dry land farming and the tending and care of ruminatory animals. Under-employment and/or unemployment remains a concern which has only partially been ameliorated by a rapid expansion of service-sector activity in major urban areas. Over the past 5 years Iran has experienced a spurt of economic growth attributable to sharply rising oil revenues, the ready availability of external resources, the existence of able and aggressive entrepreneurial elite, and continuing political stability.

Oil and a strategic location combine to give Iran substantial geopolitical importance. Steadfast support of Pakistan and Turkey, a sensitivity to Arab interests, and a growing and modern military establishment assure Iran of widespread official entree and influence throughout the Persian Gulf area and permit it to exert regional leadership.

Iran is a particularly suitable partner for technical cooperation with the United States. Numerous Iranians were educated in America, the use of English is widespread, and a large portion of Iranian managers in both government and private industry are receptive and able to use U.S. techniques and technology. Iran is able to pay for external services, in fact makes extensive use of foreign know-how, and has pragmatically sought to adapt modern methods to the Iranian environment. Further, U.S. interest in Iran will continue to be large and dictates the continuation of a close relationship which can only be reinforced by the establishment of further technical ties.

Iran will continue to be a major world source of petroleum and an increasingly important supplier of basic metals and raw materials. Given continued political stability, the Government's control over an unusually high proportion of national income, and the relative abundance of highly talented personnel resources, Iran may well become the first of the major developing nations to create a modern, consumption-oriented society with a living standard comparable with those found in parts of Western Europe.

Appendix 4

Bilateral Technical Assistance

H. G. Buller

In 1969, 2 years after termination of the A.I.D. bilateral program, technical assistance to Iran on a grant basis from all sources had an estimated value of $12.5 million. This total was made up of projects financed by the United Nations Development Program (UNDP) ($3.75 million); regular programs of the U.N. specialized agencies ($1.6 million); bilateral programs ($5 million); and other programs [1] ($2.2 million). The table following breaks down these bilateral programs.

The United Kingdom and West Germany had the largest of the bilateral programs, each of virtually the same size and together making up almost one-half of the value of all these programs. France and Japan were next in size of programs.

Personnel services was the principal form the bilateral programs took both in aggregate and in the case of the individual donor country, except for West Germany and India where fellowships was the principal form. Only in the case of the Japanese program was equipment a major component.

Education and Science, Industry, and Agriculture were the major activity fields, accounting for more than one-half of the total estimated value of these bilateral programs. The following activity fields were given the largest shares of program funds by the countries indicated: Education and Science (United Kingdom); Industry (West Germany); Agriculture (France); and Public Utilities (Japan).

The 1969 Annual Report by the U.N. Resident Representative in Iran, from which the above information was derived, stated that except for the UNDP program, technical assistance from other sources "remained at about the same level as in the previous year and no major change in the volume of assistance is anticipated in the years ahead . . ." This is borne out by the Resident Representative's Annual Report for 1970[2] which shows an increase in the total estimated value of technical assistance to Iran on a grant basis, from $12.5 million to $16 million. The increase is largely accounted for by an increase in UNDP assistance and suggests that some slack in technical assistance to Iran since the termination of the A.I.D. program may be being taken up by the UNDP.

[1] These other programs included the U.S. Atomic Energy Commission ($69,000); Fulbright program ($165,000); the U.S. Peace Corps ($1.2 million); Near East Foundation ($172,000); Population Council ($161,000); Cento Scientific Secretariat ($168,000); Regional Cooperation for Development ($150,000); and the European Working Group ($88,000).

[2] The 1970 report does not provide information for a breakdown of bilateral assistance similar to that made for 1969.

Bilateral Technical Assistance to Iran in 1969

(By donor country, form of assistance and major activity field)

[In thousands of dollars]

Donor country	Personnel services	Fellowships	Equipment	Total	Major activity fields
Austria	208	226	.....	434	Education and science.
Belgium	37	.....	.....	37	Agriculture.
Denmark	80	17	.....	97	Agriculture.
West Germany	422	647	60	1,129	Industry (including mining) and agriculture.
France	740	70	.....	810	Agriculture, education and science.
India	.....	188	.....	188	Industry.
Japan	219	69	320	608	Public utilities, industry (including mining).
Netherlands	151	58	.....	209	Agriculture.
Norway	260	.....	.....	260	Social welfare.
Sweden	55	.....	.....	55	Social welfare, public administrative and other services.
Switzerland	5	.....	.....	5	Multi-sector.
United Kingdom.	727	300	112	1,139	Education and science, public utilities, agriculture, health.
Total	2,904	1,575	492	4,971	

Appendix 5

Agriculture

A. H. Moseman

I. Agriculture in Iran

Background information on Iranian agriculture is available in numerous reports in A.I.D./W and in the U.S. Department of Agriculture and will only be summarized here.

U.S. Technical Assistance grants from 1951 through 1967 totaled $141.5 million, of which $17.8 million was for agriculture. The development areas supported in agriculture were:

(1) Improvement of agricultural practices (extension)
(2) Crop improvement
(3) Livestock improvement and disease control
(4) Forestry and conservation
(5) Improvement of water resources and facilities
(6) Land reform, agricultural credit and cooperatives.

There has been some continued collaboration since 1967, primarily through USDA participation in the Regional Pulse Improvement Project initiated in 1964, and through projects supported under P.L. 480 funding. While U.S. technical collaboration is now a modest presence, there are numerous projects in agriculture supported by other countries and by international agencies.

The emphasis by the Government of Iran (GOI) on industrialization has achieved substantial progress, especially during the Fourth Plan Period, 1968-73, when industrial growth increased at a rate of about 10% per year.

The agricultural sector, however, has lagged and is to be given priority attention in the Fifth Plan Period, beginning in March 1973.

Some specific factors of concern are:

(1) The rapid population growth, about 3% per annum, together with increased per capita income of 10 to 12% per year, which is boosting requirements of selected food products, particularly meat and other protein food.

(2) The fluctuating production of wheat, oilseeds, and feed grains, requiring substantial imports in some years.

(3) The prospects of heavy imports of meats, projected to as much as 400,000 tons of red meat annually by 1975 unless domestic production is increased.

The Government of Iran has taken action to strengthen the agricultural sector by:

(1) Consolidation of functions related to agriculture into:
  (a) Ministry of Agriculture and Ministry of Natural Resources
  (b) Ministry of Cooperatives and Rural Affairs
  (c) Ministry of Water and Power

(2) Designation of H.E. Mansur Ruhani, as the Minister of Agriculture and Supervisor of the Ministry of Natural Resources.

(3) The tentative allocation of about U.S. $4.6 billion to agricultural development during the Fifth Plan Period.

II. Survey Team Review of Agricultural Sector

The needs and opportunities for technical collaboration in agriculture were reviewed by the Survey Team with Minister Ruhani of the Ministries of Agriculture and Natural Resources and members of his staff on January 21, 1972. This comprehensive discussion was a culmination of earlier discussions by Team members with officers of the Ministries of Agriculture and Natural Resources on January 10, 12, and 17; the Plan Organization on January 17; and Karaj Agricultural College of the University of Tehran and the Animal Husbandry Research Institute on January 18.

In addition to the contacts with Government and College officials, the meetings with two of the principal private organizations concerned with consulting and development programs in Iran were most helpful. These two organizations, (1) Resources and Development Corp., and (2) Hawaiian Agronomics, Inc. have been involved in Iran for the past 16 years.

Discussions with Dr. C. S. Stephanides, Agricultural Attache of the U.S. Embassy, Tehran, were especially useful because of his length of experience in Iran (starting with the Point IV assignment in 1951) and his broad acquaintance among GOI officials.

III. Priority Problem Areas and Opportunities for Technical Collaboration

In the discussions with officials of the Ministries of Agriculture and Natural Resources, the Plan Organization, and others, the following programs or problem areas were mentioned as possibilities for Iran-U.S. cooperation:

(1) Increasing livestock production.

(2) Marketing (of production inputs to farmers and of agricultural products to consumers).

(3) Training of management personnel for corporate farms of cooperative farming (involving small holdings resulting from land reform).

(4) Land levelling for large-scale irrigation projects.

(5) Forestry development.

(6) Fisheries development.
(7) Training for scientific and technical staff.
(8) Cereal crop improvement, with emphasis on wheat.
(9) Oilseeds production.
(10) Soil management, range management, and watershed management.

The attitude of top echelon GOI officials toward potential U.S. technical collaboration is reflected in their encouragement to the Survey Team to visit as many of the agricultural research service centers and to discuss problem areas with as many of the Iranian agricultural specialists as would be possible during the Team visit.

IV. Increasing Livestock Production

The problem area of greatest concern in the agricultural sector for the Fifth Plan Period is increasing the production of protein, particularly meat. This was the principal subject reviewed by Minister Ruhani and his colleagues in the meeting with the Survey Team on January 21. The subject also was taken up by Minister Ruhani in his meeting with Secretary of Agriculture Earl Butz in Washington on January 14, 1972.

Iran has about 45 million head of sheep and goats, and 8 to 10 million head of cattle. The annual production of red meat is about 400,000 tons. Poultry production is around 50,000 tons and fish production about 15,000 tons. Fish consumption per capita is low and is not likely to increase because Iranians prefer red meat. It is expected that Iran may be forced to import up to 400,000 tons of red meat by 1975 unless steps are taken to increase domestic production. Meat imports are now coming from Turkey, Australia, Bulgaria, and elsewhere.

The strengthening or expanding of livestock production will involve:

(1) Upgrading of cattle, including introduction of new breeding stock.
(2) Determining the potentials of various livestock development zones.
(3) Establishment of improved pastures and improved grazing or management regimes.
(4) Increasing production of feed grains and alfalfa.
(5) Development of water-supplies.
(6) Development of new town centers with feed mills, feed lots, slaughterhouses, cold-storage and local industries devoted to animal byproducts, cheese making, rug and carpet making, etc.
(7) Improvement of local roads and transport systems, as well as transportation to centers of supplies and consumption.

V. Proposed Approach

The livestock production program will be concerned with expanded production facilities and operations to enable Iran to become self-sufficient for meat supplies in the next 20 years.

The technical assistance required transcends the usual "extension specialist" or "research specialist" type of help. Extension specialists would be ineffective since there are many facets to the animal production problems for which satisfactory solutions remain to be worked out. Narrowly-focussed research specialists would be of limited help because of the several interrelated factors requiring concurrent resolution.

The operation should be approached from an integrated systems standpoint, with attention to all of the major factors involved in the livestock production, feed lot, processing and marketing functions.

It would seem desirable to consider, for an initial team, specialists in the following fields:

(1) Livestock improvement and management.
(2) Range and pasture management.
(3) Feed crop (grain and alfalfa) production.
(4) Agricultural economics (with attention to production economics and to marketing, including grading, price policies, etc.).
(5) Slaughterhouse design and operation.

It is probable that some of the specialists would be required for a minimum of 3 to 5 years, with others for shorter terms or for a number of intermittent visits to Iran. There are a number of young Iranians well trained in range management who would benefit from short term consultation and who might be capable of handling the followthrough conduct of that aspect of the program.

To activate the collaborative program prompt attention should be given to selection of the Specialist Team Leader. This should be a senior person with broad experience with problems involved in livestock improvement and production. A private-sector cattleman, responsible for a sizeable integrated livestock production program, would appear suitable.

One such resource would be a ranch or other company with large-scale production operations from which experienced persons could be drawn. A Dean of Agriculture, Director of an Agricultural Experiment Station, or USDA livestock specialist would be other possibilities. In any case, the Team Leader should be knowledgeable and appreciative of the interrelated problems, with sufficient stature and capability to command respect of the GOI officials, of the team of U.S. specialists, and of the numerous organizations in Iran involved in various allied aspects of agricultural development.

The Team Leader should be provided at an early date, to work with appropriate GOI officials for a period of 60 to 90 days to define the nature and scope of the program. This initial review might also benefit from the participation of an animal scientist, range management specialist, agronomist, and economist.

In view of the objective of the Technical Cooperation Survey Team headed by Dr. Branscomb to consider procedures for facilitating arrangements for U.S. relationships, it would seem appropriate for the Technical Assistance Bureau (TAB) of A.I.D./W to take some initiative in followup action with the GOI and the USDA. TAB staff, including Messrs. Hyde Buller, Erven J. Long, Omer Kelley, Milo Cox, Nels Konnerup, and Douglas Caton, as well as others, could furnish valuable inputs in preliminary planning of the U.S. participation.

In setting up the specialist team it would be helpful to solicit views of U.S. personnel who have been involved in Iran with livestock and range management programs. A number of the staff members of Utah State University have such experience. Dr. R. E. McDowell, Professor of Animal Science at Cornell University, reviewed the Animal Husbandry Research Institute program at Heydarabad and should have useful judgments to contribute. Dean Dale Bohmont of the College of Agriculture, University of Nevada, has served as a consultant to the Resources and Development Corp. and appears to be well regarded in Iran. The TAB or NESA staff of A.I.D./W also should be able to identify persons who are or have been involved with livestock production in near East or Middle East countries.

There are a number of organizations already involved in livestock improvement and development activities in Iran. These include the UNDP/FAO support for the Animal Husbandry Research Institute at Heydarabad, and a program on range management studies reportedly aided by Utah State University and the UNDP/FAO. The pilot project to be undertaken with support from Hawaiian Agronomics, Inc. in the Moghan Plain area appears to be one commitment involving a private consultant/operating organization. The specialists drawn from the United States for the proposed project would be expected to coordinate their activities with the foregoing and other organizations concerned with livestock production in Iran.

It is most important to keep in mind that the livestock development program is regarded by the Minister of Agriculture and Natural Resources, and by Plan Organization officials, as a top priority activity in the Fifth Plan. The decision to request U.S. expertise to assist with this program is a creditable reflection on the recognized capability and stature of U.S. agriculture. It will be essential for the U.S. Government agencies involved, particularly A.I.D. and the USDA, to give this cooperative effort sufficient commitment and attention to ensure that performance in the cooperative venture meets expectations.

Iran is moving toward agri-business and larger scale corporate or cooperative farming operations. This will undoubtedly precipitate some economic/social problems, as will the effort to stabilize nomadic tribesmen into the proposed agricultural centers. Officials of the GOI recognize the problems in trying to change the way of life of nomadic tribesmen. It is expected that the stabilizing of livestock production in the various new community centers will require 20 years or more.

Decisions relating to these problems will be the responsibility of the Government of Iran, but the U.S. specialists must have a full awareness and appreciation of the nature and magnitude of such issues.

VI. U.S. Interest in Improvement of Agriculture in Iran

There is continuing worldwide concern about the high rate of population growth and the problem of meeting world food needs of the future. The population of Iran is increasing by about 3.0% or more annually and action must be taken to ensure greater quantities of domestic food supplies in coming years.

There should be expanding markets for U.S. agricultural commodities and industrial products as economic development in Iran proceeds. In the livestock production program for which U.S. specialist help is requested there is the potential for sales of selected U.S. breeding animals and of greater quantities of feed grains. Minister Mansur Ruhani called attention to this in his meeting with Secretary Butz on January 14. The trend in Iran toward larger scale farming operations, via corporate farms or cooperatives, furnishes an opportunity for increased sales of farm machines, agricultural chemicals, and other industrial products.

There is a mutual interest in the collaborative livestock production effort in expanding knowledge of agricultural technology related to animal management, range management, crop and livestock pests and diseases, and other problem areas.

The overriding interest in responding to invitations for technical cooperation in Iran is the strengthening of good will and international relationships, not only between the United States and Iran, but also with other countries in the region which may benefit from the introduction of improvements in livestock production and other developmental activities.

Appendix 6

Mineral Exploration and Development

J. A. Reinemund

Although mineral production has heretofore contributed no more than a few percent[1] of Iran's Gross National Product, the mineral sector could become a major source of export income and a base for substantial industrial development. A small but growing production (table 1) mostly of lead, zinc, chromite, and industrial non-metallic minerals is now being augmented by rapidly increasing production of iron ore and coal for Iran's new steel industry. Within a few years, a major increase in copper production can be achieved if mining of newly discovered deposits is started (Central Treaty Organization, 1971). Substantial increases in export of lead, zinc, and chromite can also be achieved from deposits already known. Furthermore, the geological environment in Iran is exceptionally favorable for the discovery and development of additional deposits of exportable minerals (such as copper, lead, zinc, molybdenum, tungsten, and chromium ores) as well as raw materials for local industry (such as fertilizer, chemical, ceramic, and refractory materials).

Recognizing the potential importance of the mineral sector, the Plan Organization of Iran has assigned a high priority to mineral projects in the development budget for the Fifth 5-Year Plan beginning in March 1973. The Ministry of Economy, which is responsible for mineral exploration and development, recognizes the need to accelerate geologic mapping as a means of identifying mineral districts or target areas, to intensify the exploration and appraisal of mineral districts, and to stimulate the mining of known deposits. Development projects under active consideration range from a $30 million 3-year mineral survey of about 280,000 sq. km. in eastern Iran to a several hundred million dollar mining and smelter complex based on the 400 million ton low-grade copper deposit at Sar Cheshmeh (fig. 1).

Because of the high priority Iran has assigned to mineral exploration and development, it was decided to include an evaluation of Iran's scientific and technological needs in this sector as part of overall study of possibilities and mechanisms for future technical cooperation. Consultations were held in Iran between January 9 and 22, 1972, by a team under the auspices of the U.S.

[1] The exact mineral production of Iran is uncertain because substantial amounts of raw material produced locally for construction (sand, gravel, clay, and lime) are from unlicensed mines and are not systematically reported. In 1968, for example, the Ministry of Economy (Bureau of Statistics, 1969) reported that of 1,103 operating mines, 433 were "nonorganized" or unlicensed and their production was largely unrecorded.

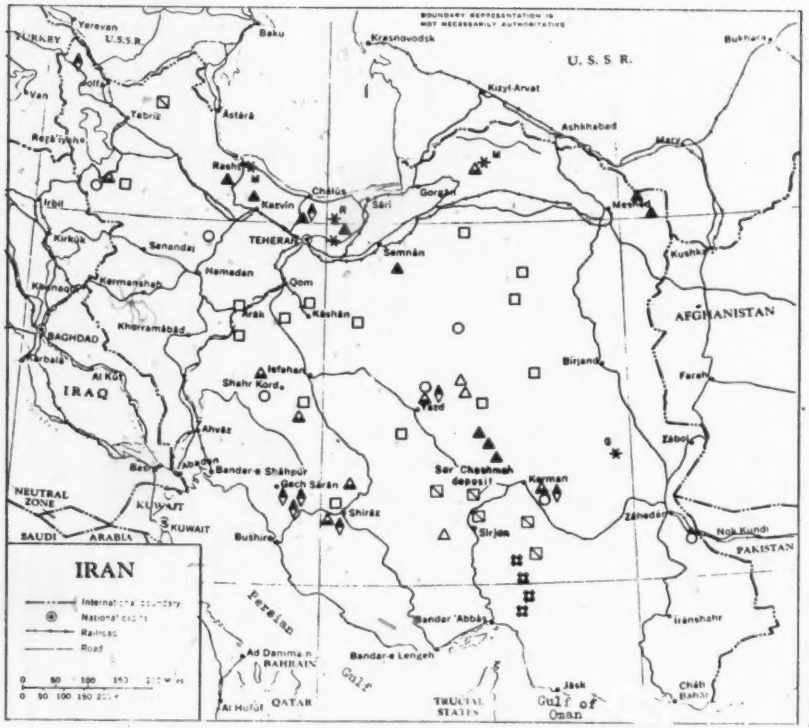
TABLE 1. *Mineral production of Iran from 1968 to 1970*

(Information supplied to U.S. Embassy by Bureau of Statistics, Ministry of Economy, except as indicated)

Commodity	Production in metric tons		
	1968	1969	1970
Alum	4,100	4,182	4,213
Barite	53,319	58,619	60,219
Bentonite	.....	.....	(12,000)
Building Stone	(4,267)	(7,130)	(6,900)
Celestite	.....	.....	(300)
Cement	[1] 1,904	[1] 2,342	[1] 2,577
Chromite	241,000	289,000	308,000
	(140,000)	(150,000)	(200,000)
marketable	90,000	140,000	120,000
Coal	296,006	308,678	322,652
	(380,000)	(430,000)	(460,000)
Copper ore, total	12,313	10,300	14,432
	(7,970)	(13,500)	(3,370)
metal content	620	520	720
Gypsum (crude)	[1] 1,520	[1] 1,596	[1] 1,676
Iron ore	1,347	1,650	1,858
Kaolin	31,750	33,660	35,122
Lead Ore	49,083	48,222	50,978
	(36,177)	(73,000)	(50,700)
Lead and zinc	.....	.....	(97,000)
Limestone	[1] 3,138	[1] 3,295	[1] 3,459
Magnesite	25,000	21,000	20,000
	(6,700)	(6,900)	(7,000)
Manganese ore	32,580	35,000	36,000
Marble	(11,580)	(10,000)	(12,000)
Orpiment	(350)	(400)	(300)
Red ochre	(5,903)	(5,100)	(8,000)
Salt (rock)	214,222	235,644	252,321
Silica	31,667	33,250	34,913
Sulfur (refined)	1,300	1,400	1,300
Sulfur ore	(37,000)	(38,000)	(38,000)
Turquoise	298	300	300
Zinc ore	80,778	88,669	94,460
	(51,112)	(48,000)	(38,300)

[1] In thousand tons.

Figures in parentheses were obtained from Iranian delegation report to CENTO Advisory Group on Minerals Development, Dec. 5, 1971; differences in figures from the two sources probably represent differences in bases of computation.



Information modified from Iranian Delegation Report to CENTO Advisory Group on Minerals Development.

FIGURE 1. Significant mineral localities in Iran.

Agency for International Development (U.S. A.I.D.).[2] Meetings concerning the mineral sector were held separately with representatives of the Plan Organization, Ministry of Economy, Geological Survey of Iran, Iranian and United States private business, as well as academic and research institutions concerned with mineral exploration and development or related activities. All those consulted were very cooperative and forthright in discussing their programs, future plans, and scientific or technological needs, and their assistance is deeply appreciated.

Unfortunately, in the short time available it was not possible to contact all those whose responsibilities and viewpoints are pertinent to this study. This report, therefore, is neither an exhaustive review of the mineral sector needs nor a comprehensive blueprint for future technical cooperation, but it does identify some possibilities for joint action that seem to be feasible and of interest both in Iran and the United States.

U.S. Interest in Iran's Resources

Technical cooperation with Iran in the mineral sector can serve U.S. interests in Iran's resources as well as Iran's interests in its own economic advancement.

Iran's status as a major petroleum producer (and currently one of the world's leading oil exporters) is a dominant factor in U.S. considerations and plans relative to international security. Iran has taken a leading part in the oil-pricing negotiations of the Organization of Petroleum Exporting Countries (OPEC) with American and other major oil companies, and Iran's posture relative to production and supply of petroleum will likely be of increasing importance in the future relationships between oil producing and consuming countries. Moreover, Iran is a major supplier of petroleum to Japanese and European markets and a stabilizing influence relative to production from the Persian (Arabian) Gulf oil fields which are vital sources of supply for U.S. allies. Technical cooperation to broaden Iran's resource base and help develop alternate sources of income can indirectly contribute to Iran's stability and reliability as a petroleum supplier.

The United States also has direct interests in Iran's mineral resource development. Many American mining companies have been actively seeking to invest or participate in the development of Iranian minerals, especially copper, lead, and zinc. These and other mineral resources, such as metallurgical-grade chromite, could become strategically important to the United States as future sources of supply. Competition is increasing among developed countries for influence in Iranian resource development through the medium of technical cooperation or investment in the mineral sector (Russia in iron and steel; Japan and Germany in copper; England in geological mapping and base metals; France in mineral surveys). Moreover, Iran offers a substantial market for U.S. resource-survey contractors and for consultants in mining and related industries.

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[2] See app. 1 to main report.

A further U.S. interest in Iranian mineral resources is Iran's potential for supplying needs of adjoining countries, and for joint development with neighboring countries as a means of promoting regional stability. Many potentialities exist for using Iranian mineral products in Pakistan, for using excess Pakistani and Turkish geological and engineering manpower in Iran, and for coordinated infrastructure development of mineral districts extending across Iran's boundaries with Afghanistan, Pakistan, and Turkey. These potentialities, which have not yet been intensively studied, depend heavily on the strength and vitality of Iranian mineral development, to which U.S. technical cooperation can make a significant contribution. It is precisely such considerations that have motivated the CENTO Advisory Group on Mineral Development, of which the United States has been a consistent supporter.

Finally, Iran offers an exceptionally favorable area for the study of many geological and mineral phenomena of interest to the United States. The U.S. Geological Survey (USGS) proposal for a joint research project (Krinsley, 1971) for the study of playa deposits using satellite imagery is an example of such interest. Iran's unique position as a collision-zone between two continental plates in the earth's crust offers many possibilities for studies of tectonic and mineral emplacement phenomena that are not as favorable anywhere else.

Thus, improved mechanisms for making U.S. expertise in the mineral sector more readily available to Iran can be helpful not only to Iran's development but also to the advancement of many strategic, security, and scientific interests of the United States.

Nature and Significance of Iran's Needs in the Mineral Sector

Subsectoral Activities and Requirements

Mineral exploration and development involve scientific, technologic, administrative, and management functions ranging from geologic investigations to the marketing of mineral products. These functions may conveniently be grouped in four categories: geological mapping; mineral exploration and appraisal; mining technology and development; program definition and analysis. The Geological Survey of Iran (GSI), which functions under the Ministry of Economy, has primary responsibility for geological mapping and mineral appraisal; the Ministry of Economy, Under Secretary for Mining, has immediate responsibility for mining technology and development; and both the Ministry and Plan Organization are concerned with program definition and analysis, including sectoral goals and courses of action.

The discussions in Iran showed that the officials concerned with these functions recognize needs for technical cooperation in all four categories, and are willing to consider importing consultants and technology at Iranian expense if necessary to fill these needs.

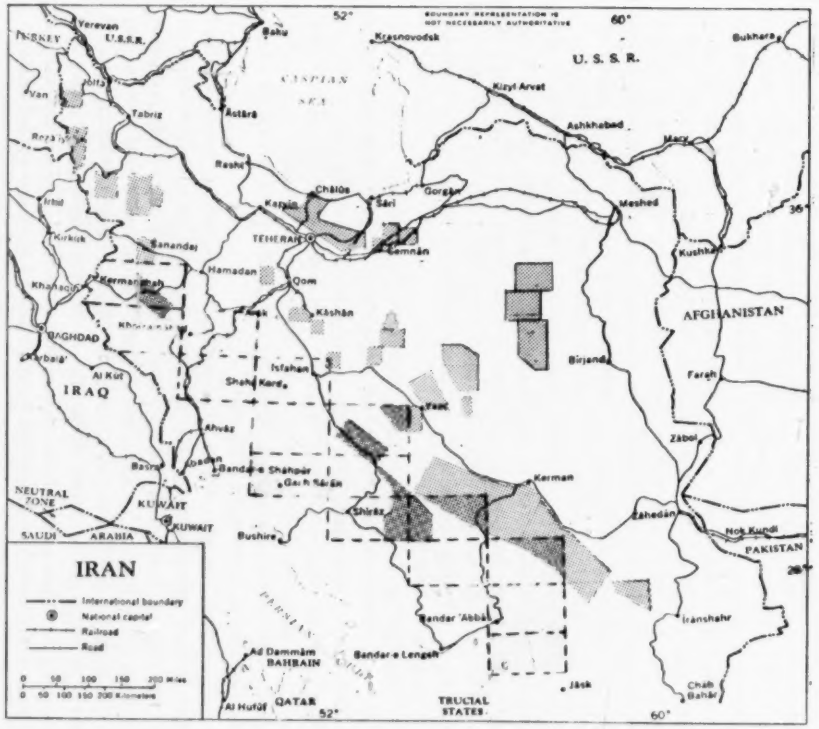
Geological Mapping

One of the most urgent and fundamental needs in the mineral sector is an accelerated and intensified program of geological mapping. Although a large part of Iran has been covered by geological reconnaissance (fig. 2) and much geological information is available (National Iranian Oil Co., 1959; Stocklin, 1968), very little of the country has been mapped in the detail needed to identify target areas for mineral exploration. Most of the known mineral deposits were discovered because of fairly obvious surface indications, without the geological maps needed for application of scientific techniques to locate hidden deposits.

The Geological Survey of Iran is well qualified and equipped for general-purpose geologic mapping and has underway a systematic program of regional mapping at scales of 1:100,000 or smaller. However, owing to shortage of qualified personnel, the rate and scale of GSI mapping are less than required to meet the development needs of the country, not only for mineral discovery but also for land classification, water resources studies, public construction projects, and rural development planning. Accordingly, the Plan Organization is considering awarding contracts for such mapping over an undeveloped area of 280,000 sq. km. in eastern Iran, for which field work is to be completed in 2 1/2 years. Several American companies are competing for these contracts. Consideration is also being given to a 5-year program to cover all unmapped areas in Iran at a scale of 1:250,000 and also to update existing maps, where necessary, to achieve comparable standards of accuracy and uniformity of geologic interpretation. An analysis of the manpower requirements for such a national program shows that at least 20 to 25 man-years of professional work would be required each year for the 5-year period to complete such a project, in addition to the staff that might reasonably be provided by the GSI. At present the GSI apparently has a capacity of not more than 10 man-years per year to devote to regional mapping.

An accelerated mapping program of such magnitude involves two serious problems. The first problem is to establish and maintain adequate, uniform standards of mapping and geologic interpretation. This is especially difficult when large numbers of contract geologists are involved, for inevitably their diverse backgrounds and experiences will tend to result in discrepancies between the various map areas and cause difficulties in interpretation. The second problem is to rapidly evaluate and apply the results so as to accelerate the identification and exploration of mineral deposits. To some extent this can be done by publishing the maps as they are completed and encouraging private industry to follow up any favorable mineral indications. However, it is unlikely that the maps, at such a scale, will be definitive enough to justify private expenditures for exploration unless more detailed mapping, including geophysical and geochemical surveys, is carried out in favorable areas. This will likely require continuing and increasingly detailed work over a considerable period of time by the Geological Survey of Iran and will necessitate an appreciable increase in capacity of that agency.

These two problems could perhaps be diminished by rapidly strengthening the GSI sufficiently so that it can accelerate the regional mapping already un-



Geological maps at scale 1:250,000 by National Iranian Oil Company and other companies.

Geological maps at scale 1:100,000 mostly by Geological Survey of Iran.

Map prepared from materials supplied by Iran to the Economic Commission for Asia and the Far East

FIGURE 2. Extent of geological map coverage of Iran.

derway, be responsible for the coordination and technical supervision of the work of any contractors assigned, and be prepared to follow up the results with more detailed studies in favorable areas. Such a course of action is, in fact, being considered by the Ministry of Economy but would require considerable technical cooperation in training additional GSI personnel and in the introduction of certain techniques for accelerating the compilation and publication of maps. The possibilities for USGS cooperation in this, helping to accelerate the national mapping program and concurrently strengthening GSI, were raised by officials in both the Ministry and the Plan Organization.

Mineral Exploration and Appraisal

A second category of need in the mineral sector is for help in developing a capability for detailed geological, geophysical, and geochemical studies to appraise the resource potential of mineral target areas identified through geological mapping. Although the GSI has basic facilities and some personnel for such work, it does not yet have the capacity to carry on an intensive mineral appraisal program. As a result, the GSI has not been able to collect and publish definitive information about resource potentials for most of the known mineral districts, to provide a factual basis for mine investment. The paucity of such information is a serious handicap to the Iranian mining industry, to foreign investors, and to economic analysts in the Plan Organization.

In an effort to initiate a mineral exploration program, a contract was awarded to a geological institute in Yugoslavia about 2 years ago for studies in a belt of copper-bearing intrusive rocks in southern Iran. This work will provide much helpful information, but more intensive work will probably be needed for a thorough appraisal of the area. Moreover, the program does not involve strengthening of the GSI.

The GSI and the Ministry recognize the continuing need for technical help in accelerating mineral exploration and appraisal. The Managing Director of GSI specifically requested U.S. Geological Survey cooperation in the introduction of new exploration techniques; in cooperative studies of ophiolite zones and associated ultramafic rocks containing chromite, magnesite, asbestos, and other minerals; and in the introduction of analytical data-processing and interpretation methods.

Some training in exploration and appraisal techniques has been provided by the United States and the United Kingdom through the CENTO Field Training Course conducted each summer since 1966 for young geologists from Iran, Pakistan, and Turkey. Two of these courses were held in Iran, one in the Lakar Mining District and one in the Kushk Mining District. Reports issued as a result of the course work such as the one prepared by Bailey and Barnes (1969) illustrate the types of studies and training that are needed and for which more continuous help has been requested from the United States.

Mining Technology and Development

The mining industry in Iran includes a few relatively affluent and vigorous industrialists, whose operations account for a major part of mineral produc-

tion, plus several hundred smaller operators and prospectors. In the past, the Iranian Government has regulated the industry (Ely, 1961) but has not actively stimulated it. There now appears to be a genuine interest in helping the industry, especially through a program of assistance to the small-mine operators who may need both technical guidance and financial help until they can carry forward on their own. Officials in the Ministry of Economy and also in the Plan Organization discussed the need for such a program, which might include a technical staff to help mine operators and prospectors with lease applications, mine surveys, geological and technological problems; equipment to carry out exploratory mining and drilling at low cost; and loan funds for such exploration. The provisions of the program conducted by the Office of Mineral Exploration in the USGS were discussed in relation to the Iranian needs.

Of greater concern to the larger mine operators is the shortage of mine labor and supervisory personnel. The academic training given at Teheran University in mining engineering does not produce either working-level mine labor such as mechanics, or supervisory-level personnel such as senior engineers and mine superintendents. Although the need for technical help in a training school for such personnel was not specifically mentioned by the Plan Organization or the Ministry, the industry appears to be highly concerned about such help. Similarly, it is evident from a CENTO seminar held in Turkey (Central Treaty Organization, 1966) that there is substantial support in Iran as well as the other CENTO region countries for training in mine health and safety.

It is apparent that the mining industry is apprehensive about future governmental policy toward private investment. Apart from a forthright statement of policy in this regard, a mining assistance program and a training program for mine labor would contribute greatly toward building confidence toward government. It is interesting to note that more than a decade ago the Government of Iran, with help from the Agency for International Development, established an Industry and Mines Development Center to promote private investment (Government of Iran, 1960) but this effort does not seem to have been productive insofar as the mining sector is concerned. The failure to advance mining investment through this mechanism seems to be attributable in part to investor uncertainty about governmental intentions and partly to the lack of mineral resource information mentioned previously.

Program Definition and Analysis

Management and decision-making for ongoing programs in the mineral sector (funded from the "regular" budget) are the responsibility of the Ministry of Economy but new programs (funded from the "development" budget), such as the proposal for a contractual mineral survey of eastern Iran, require the approval of the Plan Organization. Apparently the Plan Organization approval extends not only to the allocation of funds but also to the organization of the work and the selection of contractors.

It is clear from the discussions that both the Ministry and the Plan Organization keenly feel the need for greater expertise to guide them in their

decision-making in this sector. This need has been reflected in the delay in deciding on a course of action for the proposed mapping in eastern Iran, in the long delay on the Sar Cheshmeh copper development, and in the continuing uncertainty relative to objectives, techniques, methods, and organization required for a national mapping program.

The deficiency in expertise at the decision-making level has created four problems with which the responsible officials in this sector evidently feel the need for guidance:

(1) How to identify and organize courses of action to meet priority development needs for promoting mineral discovery and development;
(2) How to learn about and draw upon new exploration and mining technology applicable to Iran's needs;
(3) How to recognize, evaluate, and utilize expertise now developing within Iran such as in the Geological Survey; and
(4) How to select qualified contractors or consultants who will objectively serve the Nation's interests and also deliver an acceptable product.

To help with these problems, the Ministry of Economy has sought to import qualified consultants. During the past 2 years, representatives of the U.S. Geological Survey and U.S. Bureau of Mines (USBM) have had several discussions with officials of the Ministry specifically about a Ministry request, directed through the U.S. Embassy, for a Senior Geologic Consultant from the USGS and a Senior Mining Consultant from the USBM to assist the Under Secretary for Mining. The USGS and USBM have agreed to provide such consultants, if arrangements can be made for reimbursement.

The need for a Senior Mining Consultant may have been filled partly or wholly by the recent appointment (November 1971) of Mr. Charles Brinkerhoff, formerly Board Chairman of the Anaconda Copper Co. Although Mr. Brinkerhoff is currently involved almost entirely in the plans for developing the Sar Cheshmeh copper deposits, it is his understanding that he will be concerned with consultive assistance to the Ministry on problems of mining development generally. This appointment is a good illustration of one route for obtaining technical expertise at a high level, and the terms of the appointment demonstrate the Iranian concern that such expertise should be as objective and free of outside involvements as possible.

Summary of Iranian Needs for U.S. Cooperation

Iran's present needs for technical cooperation from the United States in the mineral sector may be classified in three categories: (1) help in improving resources institutions, programs, and investigational techniques; (2) help in accelerating and guiding mineral surveys; and (3) help in importing technology and supervising mine development. The first of these can best be filled by U.S. Government (non-profit) agencies, mainly the U.S. Geological Survey and U.S. Bureau of Mines, supplemented by inputs from universities, under reimbursable, cost-sharing, or multilateral arrangements. The second can best be filled in part by private contractors (for routine, standardized

mapping) and in part by Government agencies (for specialized studies and coordination). The third can best be filled by private companies or consultants under joint ventures, company service contracts, or personal service contracts.

In the present stage of mineral development in Iran, the most compelling needs are in the first two categories mentioned above. The most urgent needs have to do with creating the institutional base for stimulating exploration and development and for identifying exploration and development opportunities. In the future, as these opportunities are revealed, the needs for technology and supervision in the opening of new mines will become more critical than they are now.

Immediate priority needs in the mineral sector are reflected in the informal requests and specific inquiries from Iranian officials about possible technical cooperation from the United States. These may be summarized as follows:

(1) USGS help to GSI in carrying out a national geological mapping program, introducing new mapping techniques and concurrently strengthening GSI mapping capability (includes cooperation in the application of satellite data for regional geological mapping and for study of surficial deposits);

(2) Private industry contractual help in some phases of the proposed geological mapping program in eastern Iran;

(3) USGS help in the introduction of new mineral exploration and data-handling techniques in research on chromite-bearing rocks;

(4) USGS and USBM help in developing a small-mine assistance capability and program;

(5) USGS and USBM help in providing or identifying consultants for program definition and analysis.

Supplemental needs exist for strengthening the academic training of geologists and mining engineers and developing a school for mine labor and mine superintendents. These needs are fundamental to vigorous growth of the mineral sector, but were not specifically discussed by the Ministry and Plan Organization officials. Current emphasis is directed more toward the importation of technology than toward the development of indigenous capability.

Iran's Sources of Technical Help

History of U.S. Assistance

The United States has had a relatively minor role in the mineral sector in Iran. There has been virtually no bilateral assistance through A.I.D. in strengthening geological and mineral institutions. More than a decade ago the United States provided a few short-range geologic consultive assignments on specific mineral problems, and from 1959 to 1965 the Agency for International Development provided a mining consultant, Wilford S. Wright, who undertook a highly successful exploration program to stimulate lead-zinc production (Wright, 1965). His efforts involved drilling and calculation of

reserves for a number of major lead-zinc deposits and subsequently led to a development drilling program within the Ministry of Economy. The program did not involve any substantive growth of a mining agency within the Iranian Government, however.

Geological assistance from the United States in the past decade has been limited to a small amount of technical consultation through the CENTO Advisory Group on Minerals Development, which was organized in 1960. This Group has conducted seminars, training programs, and short-term cooperative resource investigations supported in part by the United States (A.I.D.). These activities have provided a means of maintaining professional and institutional relationships with Iranian agencies and universities in the mineral sector, and it is hoped that they can be continued in the future even if the present structure of CENTO is changed. Such mineral activities through CENTO for the coming year are listed in table 2.

TABLE 2. *Scope of planned U.S. technical cooperation through CENTO in the mineral sector during 1972–73*

(U.S. input limited to a few man months or less in each subject area)

Subject	Location
1. Regional stratigraphic correlation and interpretation: completing a summary report and conducting a seminar.	Istanbul or Teheran.
2. Field training program in geological mapping techniques: conducting a 2-month course in a mining district each summer.	Iran and Turkey.
3. Regional phosphate investigations: organizing and guiding field studies and resource appraisals of phosphate deposits.	Iran, Pakistan, Turkey.
4. Remote sensor training program: conducting a course in the applications of remote sensors for resource surveys.	Teheran.
5. Regional tectonic investigations: organizing a program to investigate active faulting and related phenomena.	Iran, Pakistan, Turkey.
6. Regional evaporite resources: compiling information on known evaporite deposits.	Iran, Pakistan, Turkey.

A further point of contact in Iran in recent years has been a study of Iranian playas by Krinsley (1970) of the USGS, whose work has been sponsored by the Air Force Cambridge Research Laboratories and has been undertaken in cooperation with the Geographic Mapping Organization of the Iranian Army.

Other Sources of Assistance

Technical cooperation in the mineral sector has been provided by a large number of countries and agencies on a wide variety of projects. The Soviet

Union undertook the construction of the Aryamehr Steel Mill at Esfahan, and related resource development, with an initial capacity of 1,600 tons of pig iron per day. Additional blast furnaces are planned, to increase production to 2 million tons per year by 1975 and about 4 million tons per year by 1980. Further Soviet help has been announced for the construction of an aluminum plant. British and Japanese companies have entered joint ventures for mining lead-zinc and copper, respectively. French agencies have been involved in copper and uranium investigations; the British Institute of Geological Sciences has been active in geologic mapping of selected areas; German companies have made coal and copper investigations; a Yugoslav agency has been mapping a copper district under contract; and Switzerland has helped in geological map compilation. Presumably most of these sources will continue to provide technical help, at least intermittently.

One of the most important assistance projects was that conducted by the UNDP, beginning in 1960, to develop the Geological Survey of Iran. This project was highly successful in establishing the basic staff, facilities, and mapping program of the GSI but did not create sufficient capacity for mineral studies. Although this UNDP project ended last year, it is likely that it will be resumed on a small scale during 1972, to provide a few consultants for resource studies.

Constraints and Mechanisms of U.S. Cooperation

Attitudes and Constraints

As a result of this study certain conclusions can be made as to the Iranian attitudes toward technical cooperation in the mineral sector and the mechanisms and constraints under which U.S. technical cooperation in this sector could be provided.

It seems clear that the Iranians wish to use imported technology and consultive services both to accelerate the discovery and development of mineral resources and concurrently to strengthen their own institutions, programs, and investigational methods. They are not satisfied with the cooperation available from non-U.S. sources. They are willing to pay, if necessary, for U.S. technology and consultive services but are handicapped in deciding on courses of action by lack of technical knowledge at the decision-making level. Iranian hesitancy about moving ahead on mineral exploration and development projects has been, to a considerable extent, a result of uncertainty about the capability, reliability, and objectivity of contractors, consultants, or technical cooperation arrangements under consideration. The impression gained from discussions with officials both in the Ministry of Economy and in the Plan Organization is that the primary concern in obtaining contractors and consultants is with capability and objectivity rather than with cost.

In general, the Iranians seem to have a high regard for U.S. expertise and objectivity in the mineral sector and look favorably toward obtaining U.S. cooperation in this sector. Despite this favorable attitude, however, there is

great danger that intense competition from other countries will erode the opportunities for U.S. cooperation in Iran. A continuing effort will be needed to maintain and enhance the U.S. image if cooperation is to be expanded, especially in view of the higher costs of services and equipment from the United States. Improving U.S. technical capability, developing new technology, channeling information about U.S. capability into the Ministry of Economy and Plan Organization, developing various cooperative mechanisms, and perhaps allocating funds for cost-sharing activities as "seed money," are likely to be needed if technical cooperation with Iran is to be increased. The greatest strength enjoyed by the United States in the competition with other countries is the long record of professional contacts between the U.S. agencies and Iranian counterparts, together with our demonstrated capability and interest in building counterpart institutions in other countries.

Mechanisms for Cooperation

In strengthening resources institutions, programs, and investigational techniques, U.S. agencies and universities could probably respond to Iranian needs through a number of mechanisms including: continuing and enlarging the present informal institutional and professional contacts; undertaking cost-sharing research projects on subjects of mutual interest; negotiating reimbursable agreements for technical services and training; continuing regional assistance projects through CENTO or other auspices; and participating in multilateral assistance programs. It seems likely that all these mechanisms may be used if cooperative possibilities now in view are realized. Nevertheless, a more positive overall mechanism for identifying and responding to Iranian needs in the future is clearly required.

One mechanism that was discussed at length with the Under Secretary for Mining is an agency-to-agency reimbursable agreement such as the USGS has had with the Ministry of Petroleum and Mineral Resources in Saudi Arabia. Under such an agreement, a wide range of investigational, consultive, and training services can be provided, involving governmental, academic, and private institutions. Such an agreement could conceivably be used not only as a vehicle for directly supplying many of the needs identified by the Ministry of Economy and Plan Organization but also as a channel for helping identify private industry contract services that might be needed from time to time and for arranging academic exchange programs in geology and mineral technology.

In accelerating mineral surveys, U.S. Geological Survey participation, using a mechanism such as mentioned in the previous paragraphs, would be both feasible and desirable for special studies of areas and problems, or for coordination and evaluation of results, which do not lend themselves to standardized procedures and easily-measurable products. This would also permit maximum strengthening and use of the GSI. For rapid completion of standardized mapping, contractual services could advantageously be used. The Iranians should have no serious problem of identifying qualified contractors through existing U.S. Embassy and U.S. Geological Survey channels, but in order to compete successfully U.S. contractors must emphasize and demon-

strate high quality of performance to offset their higher costs as compared to other foreign contractors.

In acquiring mining technology and supervision, the Iranian desire to retain managerial control of mine operations must be recognized. The development of an indigenous government-controlled mining enterprise, based on personal-service contracts with expatriate mine specialists, which is being attempted at Sar Cheshmeh, is an interesting experiment in the importation of mining technology. Iranian officials insist that this mechanism will not be the pattern customarily followed in developing the Iranian mining industry, and it is not reasonable to expect that experienced mining personnel and mining investment capital can be generated rapidly enough to develop a productive government-operated mining industry in Iran, even if the Iranians wished to do so. Private foreign investment and company service contracts will almost certainly be needed if the anticipated rate of mineral discovery is to be matched by mineral development. It can be expected that the Iranians will insist on retaining control of all joint mining ventures, and will favor U.S. companies only if it is in the Iranian interest to do so. It is equally likely, however, that the Iranians will continue to favor U.S. consultants for personal service contracts.

As a result of this study, the following general conclusions can also be made as to the maintenance of U.S.-Iranian contacts in this sector:

(1) Frequent institutional contacts and exchange (such as between USGS and GSI) have been of great help to both Iran and the United States. Ways of strengthening such contacts should be found, so that a continuing channel exists for identifying Iranian needs and possibilities for U.S. responses.

(2) Regional organizations, such as CENTO, can serve a useful function in stimulating technical cooperation and maintaining institutional and professional contacts.

(3) Joint scientific studies, such as the proposal for study of Iranian playas, can not only help maintain international contacts but can be helpful in stimulating greater interagency coordination within the host country.

(4) Despite the many institutional and professional contacts that have been maintained with Iran, much more interchange is needed if the pertinent Iranian officials are to be knowledgeable about expertise and techniques available in the United States. This could be helped in part by more frequent visits by U.S. specialists in Iran, but may perhaps be helped even more by periodic visits of Iranian officials to technical institutions in the United States.

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Appendix 7

Science and Education

E. R. Sohns

Science

Scientific and technical manpower surveys have not been conducted and there are therefore no reliable estimates of the number of scientists and engineers in Iran. Nor does the Government of Iran have a formal statement on science policy; however, the development of such a policy is under consideration, furthered by the work of the Plan Organization.

The Government ministries carry out scientific research in support of their basic missions. Science faculties of universities and colleges also conduct research; but only 30% of faculty members actually engage in such research.

Financial support for research comes from appropriated funds, private capital, and foreign sources. In 1971, the Government of Iran appropriated about 4.9 billion rials ($64 million) for research. Of this total, the universities received about 500 million rials ($6.5 million); the Government science ministries and the Plan Organization were given the remainder.

There is no formal control over the direction of science in Iran. The ministries develop their own plans and priorities and so do the universities. Most ministries have a research bureau and one or more scientific institutes for research in fields of interest to the ministry. Cooperation between Government ministries and universities is increasing. For example, the Ministry of Agriculture and Tehran University's Institute of Genetics coordinate their genetics research.

At the Government level, the Plan Organization and the Ministry of Science and Higher Education are the two organizations most concerned with research in science and technology and science education.

Plan Organization

The Plan Organization is responsible for planning, budgeting and establishing priorities for the national 5-Year Development Plans. The Fifth 5-Year Plan is now being developed to take effect in March 1973. The individual

ministries and universities submit their plans to the Plan Organization where they are reviewed by specialists in its own technical bureaus. On the basis of these reviews, the Plan Organization establishes priorities which, for the next quinquennium, are expected to be: argiculture, mining, and social services, including education and health.

Ministry of Science and Higher Education

The Ministry provides general policy guidance in relation to science education and research in the Government universities under its direct jurisdiction. According to one report, the Ministry is concerned with science "only as part of higher education."

The Ministry has a Directorate of International Affairs (DIA) responsible for bilateral science agreements with other countries. DIA's role is one of coordination and not substantive review of programs. Cooperative scientific programs, for example, conducted by Tehran University and the University of Illinois would be reported to DIA for information purposes. Currently, cooperative arrangements are in force with France, Germany, the U.S.S.R., Bulgaria, Romania, Poland, Yugoslavia, Czechoslovakia, and the United States.

The Ministry also has an Institute for Research and Planning in Science and Education (IRPSE) concerned with organization, policy and planning in scientific research and science education. IRPSE's responsibilities include the Iran Documentation Center and the Tehran Book Processing Center. The Institute has prepared a preliminary report on the organizational elements of ministries and universities whose charters include research. The report identified organizational and operational deficiencies in the conduct of research.

A Scientific Research Council, recently established by the Ministry, serves a liaison function between the universities and the industrial communities of the country, provides researchers for the industrial sector, relates Iran's research activities to major needs, and encourages foreign investment in the country's scientific and economic development programs.

Other Government Ministries

According to an IRPSE study, there are 78 "Departments General, Directorates, Offices, Departments, Centres, Institutes, and experimental farms related to Ministries and Independent General Organizations" which conduct "research, investigation, comparison, etc." The table following shows a partial listing of fields of science and the minitries involved.

The universities and colleges also conduct research in these fields and there is coordination of research effort between the Ministries and the academic community.

Iranian Ministries Conducting Research in Scientific Fields

Fields	Ministries									
	Plan Organization	Ministry of Agriculture	Ministry of Roads	Ministry of Education	Ministry of Information	Ministry of Culture and Arts	Ministry of Water and Power	Ministry of Health	Ministry of Economy	Ministry of Natural Resources
Anthropology, sociology and related fields				X	X					
Archeology and history						X				
Psychology and educational sciences				X						
Engineering and technology	X									
Statistics	X									
Geodesy and cartography	X									
Geology and geophysics	X						X		X	
Meteorology			X							
Genetics		X								
Agricultural engineering		X								
Forestry and natural resources										X
Medical sciences								X		
Pharmacology								X		

Education

Iran has a population of about 30 million, almost half of which is under 20 years of age. With the present rate of increase of 3% per year, the population will double by 1995. The Government of Iran emphasizes the education of its people for leadership in science, education, industry, commerce and interna-

tional relations, and in its fiscal year beginning March 21, 1969, spent 10% of the national budget (current and capital) on education.[1]

In the short space of a few years, the literacy level of the population has been raised to over 30%. The Reform Program, initiated by His Imperial Majesty in 1962 and conducted by the Education Corps, has greatly increased literacy among the rural population. Iranian officials hope to have 99% of the urban children and 50% of the rural children in school in the next 5 years.

The next 5-Year Plan (1973-78) is to provide more funds for teacher training and for technical and vocational training of youth. Undergraduate training in Iranian universities is to be improved.

The Government of Iran also recognizes the need to provide higher educational opportunities for its growing student body. More than 50,000 students attend 65 institutions for this purpose in Iran. Among these institutions are 13 universities and colleges (5 Government universities, 3 private universities, and 5 colleges) with an enrollment of about 25,000 students.

Approximately 80,000 high school graduates take the National Entrance Examination for admission to colleges, universities, technical and specialized schools each year. About 25,000 of these are admitted to the institutions referred to above.

Another 25-30 thousand students study abroad. Of this total, 5,175 were studying in the United States in 1969-70.[2] It is interesting to note that of the 17 countries in the Middle East which had students in the United States, Iran had 34.2% of the total. Of the Iranian students in the United States, 78% of those for whom records are available were self-supporting. The remainder received their support from a variety of sources: the U.S. Government, the Government of Iran, U.S. colleges and universities. The Iranian students in the United States in 1969-70 may be classified by fields of major academic interest and by academic level of achievement as follows:

Fields of major interest	Total	Undergraduate	Graduate	Other
Agriculture	99	49	50	
Business administration	359	270	81	8
Education	99	40	50	9
Engineering	2,311	1,775	445	91
Chemical	218			
Civil	370			
Electrical	573			
Industrial and other	624			
Mechanical	438			
Technology	88			

[1] Source: A.I.D. Office of Statistics and Reports.

[2] Source: Open Doors 1970. Report on International Exchange. Institute of International Education. (U.S. organizations in Iran currently estimate that more than half of the total number of Iranian students abroad are studying in the United States.)

Fields of major interest	Total	Undergraduate	Graduate	Other
Humanities	641	399	86	156
Architecture	120			
Creative arts	119			
Languages and literature	237			
Liberal arts	156			
Theology	3			
Other	6			
Medical Sciences	158	96	55	7
Dentistry	11			
Medicine	33			
Nursing	14			
Pharmacy	15			
Pre-Medicine	48			
Other	37			
Physical and life sciences	714	446	246	22
Biological sciences	131			
Chemistry	219			
Geosciences	28			
Mathematics	171			
Physics and astronomy	146			
Other	19			
Social sciences	497	282	191	24
Economics	239			
History	10			
Home economics	11			
International relations	19			
Law	5			
Political sciences	85			
Psychology	67			
Public administration	10			
Sociology	32			
Other	19			
All other	8	6		2
No answer	289			

There is a lively exchange of scholars between the United States and Iran. In 1969-70, there were 97 Iranian scholars in the United States and 22 American university faculty members were in Iran. The fields of interest and numbers of scholars are shown in the table below:

Fields of interest	Iranian scholars	American scholars
Agriculture	1	3
Business administration	2	0
Education	7	0
Engineering	9	4
Humanities	6	5
Medical sciences	40	1
Physical and life sciences	17	1
Social sciences	15	8
Total	97	22

I visited Tehran University and the Arya Mehr Technical University and was impressed by the friendliness, competence, dedication, and the obvious pride exhibited by our Iranian hosts in their institutions. The briefings were well organized, informative, and frank. I consider the following as noteworthy facts:

(1) The extensive formal and informal relationships between U.S. universities and Tehran University is a matter of great interest and importance. Formal programs exist with three U.S. universities and informal ties are in force with nine others and with the Smithsonian Institution. Arya Mehr Technical University has a formal program with Michigan State University and informal links with three other U.S. universities. Formal and informal ties exist between the other Iranian universities and U.S. universities.

(2) Many of the senior staff of both universities received their training in the United States. (Many senior Ministry personnel were also educated in the United States.)

(3) The contrast between Tehran University and Arya Mehr Technical University was striking. Tehran University, with 18,000 students, has the usual administrative and management problems characteristic of large universities in the United States. Arya Mehr Technical University, with 2,000 students, must select a small number of students from a large number of applicants and try to maintain some equilibrium between fields of specialization without sacrificing quality of instruction or overloading a particular field.

Opportunities for U.S.-Iran Cooperation

Science

1. Although most of the larger universities have formal and informal ties with U.S. universities, these seem mostly limited to visits and short-term exchange of personnel. The effectiveness of these linkages could be improved and enlarged by U.S. support to American scientists and institutions for inter-

national travel and cooperative research projects and seminars. The announcement of a U.S.-Iran Program by the National Science Foundation will stimulate U.S. interest.

2. Over the last several years many U.S. observers have identified numerous scientific opportunities in which U.S. and Iranian scientists could effectively cooperate. Research topics in medicine, health, biology, engineering, the earth sciences, and other fields have been identified several times. In all these topics, the results of cooperative research would contribute both to new scientific knowledge and to the solution of human and economic problems in Iran. This kind of research may be conducted jointly by U.S. and Iranian scientists working through formal relationships between universities. Limited funds may be available from the Foundation to support the U.S. share of those cooperative research projects which may be selected by both sides.

3. Iran's Government agencies are interested in obtaining U.S. help in applied research and technology to improve the country's economic development. The applied sciences and engineering include such fields as mining (all aspects), hydrology, construction, road building, mapping, surveying, pollution, agriculture (crops, fertilizers, insecticides, soil classification, marketing, etc.), transportation, housing, and others.

4. Many Iranian officials expressed the need for a referral and information system to identify consultants, locate organizations, provide bibliographic services, purchase publications, etc., in the United States. The possibility of a branch of the Iran Documentation Center in the United States might be considered.

5. The absence of computing facilities in Iran hampers research work. Iranian scientists would like access to American computing facilities for data analysis and the training of computer technicians.

6. The Government of Iran is now interested in urban planning, environmental affairs, transportation, and other societal problems. Iranian officials asked for U.S. experts in these fields and for opportunities to train their own people in the United States.

7. Iranian officials frequently referred to the need for better planning, programming and budgeting techniques to determine objectives, establish priorities, and allocate resources. They also need middle-level management personnel and training courses for managers.

8. Iranian officials are interested in the development of science policy. The U.S. National Academy of Sciences may consider this subject in the workshop to be held in Iran in June 1972.

9. The need for science information and data-handling systems is evident. U.S. assistance in the design, development and operation of information systems would be welcome.

10. Shortage of scientific equipment and instrumentation was mentioned several times, particularly in geophysics and earthquake engineering. This problem may be alleviated through cooperative research projects with American institutions.

Education

1. U.S. work in science education curriculum development in physics, chemistry, biology, geology, and other fields is of great interest to Iranian educators. Several asked if samples were available, how they might obtain U.S. advice, and where they may obtain evaluations of U.S. curricular materials. In a meeting at one university, the poor enrollment in chemistry was ascribed to inadequate teaching of chemistry at the secondary level.

2. Iranian educators want to increase training programs for science teachers and vocational/technician teachers. Vocational training is a priority subject in the next 5-Year Plan.

3. Iranian universities and colleges have problems similar to those of our own universities: registration procedures, personnel record keeping, financial accounting methods, grant and contract administration, teaching loads, resource allocation by departments, and "bugs" in the data-handling systems. Help from the United States would be welcome on all these problems. In addition, university managers would like to study U.S. university management techniques. The advice of U.S. educators involved in the establishment and management of innovative universities, e.g., University of Wisconsin at Green Bay, is particularly desired.

Appendix 8

Water Resources

W. S. Butcher

Introduction

This is essentially an impressionistic document based on observations, conversations, and readings over a relatively short period of time. While much of the detail of water resources development in Iran is not available, nevertheless, there is no reason to believe that the views expressed here would be changed significantly if this detail were available.

Water Development in Iran

Iran is a dry country. Approximately three-fourths of it receives an average of less than 10 inches (250 mm) of rainfall annually. With this arid or semi-arid climate, development of water resources has been important in the overall development of natural resources. Each one of the successive 5-year national development plans has included a substantial amount of money for water resources development, increasing from 14 billion rials ($184 million) in the First 5-Year Plan to 42.7 billion rials ($564 million) in the Fourth Plan. While the details of the Fifth Plan have yet to be finalized, it is expected that 85 billion rials (more than $1 billion) will be included for this work. This continual development of water resources is to meet the country's expanding need for irrigation and urban supplies. Water resources facilities are also used for power generation and flood control as appropriate, so that the majority of the 11 dams now in existence are multipurpose. Since its very beginning, water resources development in Iran has drawn heavily on U.S. technology through contracts with leading engineers and consulting organizations as well as with engineering construction contractors.

Another measure of the importance of water to Iran can be seen in the fact that water was nationalized in 1968 as part of the "White Revolution." The water law passed by the Parliament to give effect to this concept makes the use of water in Iran a privilege rather than a right. The responsibility for development of water resources lies in the Ministry of Water and Power which may delegate some of its powers to regional water authorities which have been set up in eight of the 11 possible water resource regions into which the country has been divided. This responsibility of the Ministry of

Water and Power is quite broad and embraces both water resources development and water pollution control. At the present time, such control is of fairly minor concern in Iran except for some special cases.

With water resources development, as with all other development, the Plan Organization is involved to a large extent. In the past, this involvement has been even at the detail level of dealing with the contractors building water resources facilities. A devolution of functions from the Plan Organization to the Ministry has apparently now taken place. The Plan Organization is less concerned now with project details; however, it still has the final say in contractor selection. The situation seems to be one of de facto division of authority, with the Plan Organization controlling development policy and project selection while the Ministry can initiate proposals and also constructs and operates approved works.

The Water Resources Situation at Present

Contact with higher echelons in the Iranian Government concerned with water resources cannot fail to leave a favorable impression. The level of technical competence there would compare with the best that any nation has to offer. How far down below the top level this high competence goes could only be observed casually but indications are that middle management and other professionals are in short supply. It might be noted in passing that all of the water resources engineers with whom I discussed the Iranian situation were local men who had done graduate work in the United States.

Recently, Iran's water resources has been the topic of study of two visiting groups. One group was under the leadership of Dr. Dean F. Peterson, Jr., of Utah State University. Its report to the Ministry of Water and Power noted, first, the amazing progress that has occurred in Iran in dealing with its water problems. Secondly, it pointed to three areas of activity that are not being given support consistent with the magnitude of the problems involved. These three areas are (1) overall national water planning; (2) the need for an assessment of groundwater resources in view of the fact that they are being exploited fairly vigorously and that withdrawals are possibly beyond the safe yield in some aquifers; and (3) the efficient use of water.

The second group was a UNDP Water Resources Survey team under the leadership of Arthur Goldschmidt. This team considered the whole spectrum of Iran's water resources needs; and its report, which is currently under review by the Ministry of Water and Power, is understood to essentially endorse the conclusions of the Peterson report while going into some detail on a number of specific items. Although the problem areas noted in both reports are ones in which the experience of the United States would be of assistance to Iran, the last word on these topics has by no means been said here or elsewhere. Further, in discussions of these problems in Iran, all agreed with the needs noted in the two reports, but at the same time the Iranians expressed the view that these needs had already been recognized.

Water Resources Planning

It appears that until fairly recently, and possibly even now, water resources development in Iran was opportunistic in much the same way as it was in the United States. After the most obvious opportunities for development are exhausted, the decision on the best thing to do next becomes difficult. Also, Iran has suffered from what might be called the "monument syndrome." A dam and its reservoir are big and visible. Its completion can be a source of satisfaction as well as being politically rewarding to those who supported it. The associated distribution system and drainage works are not quite so visible, yet are essential to make proper use of the investment in the dam. Software such as efficient water use practices, good maintenance procedures and the like are also important ingredients in balanced water management. To date, Iran's water resources development has been relatively uncoordinated and hence unbalanced. Good, thorough national water resources planning using the systems approach will lead to a balanced integrated development program. To ensure that this comes about, Iran needs firm direction and coherence in its water resources planning. The United States could be of great help in this area. Fortunately, the Iranians have channels of communication to request help when they decide it is necessary.

A parallel can be drawn between the success story of power planning in Iran and the need now for something similar in the water resources context. The essential feature of that success story is believed to be a strong man of the highest reputation in his field (Walker Cisler of the Detroit Edison Co.) who contributed professional leadership and authority to the power planning enterprise. While the similarities between the power planning some years ago and water planning now can be exaggerated, the right man now could be very timely. If Iran asks for suggestions about a man to fill this role, there are several outstanding leaders in this field whom we should try to interest.

The Plan Organization has accepted the responsibility of preparing the way for Iran's national water planning and has a small group doing this preparatory work as a special project. In the United States, the Water Resources Council is the counterpart for such planning and it would be helpful if the Iranians could have the benefit of the Water Resources Council's experience. In view of the mutual political, professional and commercial benefits involved, we should adopt the most responsive stance we can towards cooperation with the Iranians in this area as in others where they request it.

Basic to any request for such cooperation is a need to know what technical services are available. In the water resources field, the fact that the bulk of the top Iranian personnel are U.S.-trained and hence connected to a greater or lesser extent to the U.S. technology information system through journals, U.S. colleagues, etc., means that they are, possibly with some delay, fairly much aware of the state of U.S. technology.

Specifically, in the water resources planning area, the Iranians are anxious to share the U.S. experience by having a meeting of practitioners in this field from both countries. The meeting would seem best handled as a joint workshop with joint funding. Contacts established on the team's visit are being used to find an appropriate person at each end to explore this possibili-

ty. An essential part of this activity is arranging a source in each country for its share of the necessary funding. The National Science Foundation would seem to be a possible source for the U.S. share.

At the Iranian end, it is both the Plan Organization, that has already expressed interest in such a workshop/seminar, and the Ministry of Water and Power that should be involved.

Out of such a workshop would come increased understanding by the Iranians of the nature of the water planning problem that they are now skirting. If the right persons could also be involved at this end, the Iranians might get to know the capability and personal qualities of some of our water resources leaders so that they could later take the initiative to obtain their further cooperation. For such a workshop to be successful, someone in the United States should be selected to mastermind the whole operation to make sure that it serves as many useful purposes as possible.

Technical Cooperation in General

Opportunities for technical cooperation, both for research or seminar/workshops in the water resources area are many but all have the basic theme of using existing connections between the U.S.-trained professionals in Iran and their U.S. counterparts as a communication mechanism to effect the cooperation. Such cooperation between specialists who share a common interest is the kind of activity that will go on as long as the conditions that set it up are present. These conditions would appear to be suitable funding and a continuing flow of Iranians to the United States for study and research.

U.S. education, especially graduate education, is highly regarded by the Iranians. Besides being a status symbol, it seems to be a key to top positions in Iran. If the United States is to maintain its present relationship with Iran, it is important that the flow of students to the United States and back to Iran not be slowed up. A healthy development is the attempt being made to attract U.S.-trained Iranians back to their own country. This program seems to have had a reasonable degree of success.

Technical cooperation also takes the form of Iranians' hiring U.S. consultants to solve some of their problems. Inevitably these U.S. consultants draw heavily on U.S. technology. Iranians have had considerable experience in hiring outside consultants and do this with a great deal of skill.

In the water resources field, it is the French-based consultants who currently have the largest share of the work, followed by the British. U.S. consultants are said to be doing almost as much business as the British, but on the scene there are also Yugoslavs, Israelis and Romanians. Because most of these U.S. consultants are part of multinational corporations which also use nationals of all kinds within their structure, it sometimes is not clear what a "U.S. consultant" is. It might be noted that the U.S. consultants are said to be charging $5,000 to $7,000 per man/month of professional effort, while the French and other Europeans charge $3,000 to $5,000 per man/month. At the lowest end of the scale are the Yugoslavs who charge $1,500 to $2,000 per

man/month. The fact that the U.S. consultants are the most expensive and yet have an important part of the market is a tribute to their effectiveness. If the U.S. Government were to support or subsidize their efforts, the U.S.-based companies' share of the consulting effort would obviously increase. This course of action is not suggested for water resources for several reasons, one of which is the difficulty of identifying the recipients. Another is the belief that any funds that might be available for this purpose would be better spent in more effective specific activities such as supporting joint workshops, seminars and research as well as facilitating the flow of students, possibly through student support.

In view of the experience of the Plan Organization in using engineering consultants, a finder service for commercial engineering consultants or engineering contractors would be redundant. There is an expressed need for such assistance, however, in cases where Iranians are anxious to have a consultant undertake tasks of a more limited but highly specialized kind. This particular kind of need comes out, for example, in helping Iran define policy or setting the terms of reference for other consultants in national water planning. This kind of activity might be referred to as "program definition" rather than the actual carrying out of programs.

Training in the United States is highly regarded and eagerly sought by Iranians but such training would not be appropriate for all Iranian graduate students in the water resources field. The Ministry of Water and Power's Institute of Hydroscience and Water Resources Technology gives Masters' degrees through the University of Tehran. Such Iranian institutions should be supported in giving top level professional training through the Master's level but not in awarding Ph. D.'s at this time. Iranians could obtain their doctorate training in the United States, however, where at least for the present it can be more effectively provided.

Summary

Technical cooperation and technology transfer between the United States and Iran in the water resources field take many forms. The comments below and the activities suggested appear to be most appropriate at this time to maintain and enhance technical cooperation and technology transfer to Iran:

(1) The activities in Iran of U.S. consulting engineers and engineering contractors bring U.S. technology with them, especially if Iranians are employed by these companies. While the U.S. engineering consulting firms are at a price disadvantage there, they are competing successfully and seem to have a fair share of the market. There seems no need for intervention with public funds in this context at this time.

(2) Specialist consultants of international stature are needed by Iran from time to time for policy guidance, etc. A locator service in the United States could facilitate finding the right man when such requests are received.

(3) Iranians who have had foreign graduate training, almost invariably in the United States, occupy top professional and administrative

positions in the Iranian Government. Their U.S. training as well as their U.S. contacts are important mechanisms for technology transfer. These provide perhaps the most important and durable opportunities for technical cooperation through both informal means as well as more formally arranged joint research projects and seminar/workshop activities. It is in the interest of all, both Iranians and Americans, to foster graduate training in the United States and the joint professional activities that can follow for many years after.

(4) To handle the above tasks as well as a number of ad hoc activities such as advice on information services in the United States, directing recruiting needs to appropriate places, etc., it would seem desirable for the United States to operate some kind of clearinghouse. This could watch over Iran-U.S. technical cooperation, be helpful in seeing that Iranian requests for U.S. cooperation are directed to appropriate places and be on the alert for any needs that may occur due to changes in circumstances.

Appendix 9

National Power System Development

I. Memorandum from F. von Voightlander, Project Manager, Harza Engineering Co., 1-17-72

"The National Power System of Iran is the culmination of sustained effort since 1956 when Sanderson and Porter of the United States began a comprehensive Power Survey of Iran. The results of this survey were published in an excellent report in 1957. The S & P report reviewed 26 major load centers and all the potential sites for hydroelectric development. A program of development involving the expenditure of some U.S. $89 million was recommended over a period of 10 years. At that time there was no central administration authority to undertake a program of this magnitude so implementation of these recommendations had to await the creation of a centralized authority. In the meantime the Plan Organization undertook the development of the Karadj Dam to provide water and electric power peaking capability for Tehran, assigning the engineering work on the project to Harza Engineering Co. International of the United States.

"At about the same time the Plan Organization also undertook the development of Khuzestan including the Pahlavi Dam on the Dez River with two 65-MW hydroelectric generators, the 230-kv line to Andimesh and Ahwaz and the related power distribution facilities, the engineering work for the whole project being assigned to the Development and Resources Co. of the United States. The Karadj Dam was commissioned in October 1961 and the Pahlavi Dam was commissioned in May 1963.

"In 1963 the Iran Electricity Authority was created and it provided the facilities for undertaking a development program on a national scale. Detail studies to update the Sanderson & Porter 1957 report were then undertaken for the development of master electrification programs for 10 major load centers in Iran. Six of these load center studies for Esfahan, Hamedan, Kerman, Kermanshah, Shiraz, and Tehran were assigned to Gilbert Associates, Inc., of the United States under U.S. A.I.D. Loan No. 265-H-016. These studies were begun in the 4th Quarter of 1963 and were all completed and the relevant reports issued by the 4th Quarter of 1965. In 1964-65 a study of utility regulatory procedures under the auspices of the World Bank was undertaken by Stone & Webster of the United States for the Iran Electricity Authority.

"In order to accelerate progress it was recognized that an agency of ministerial level would be more effective and so in 1964 the Ministry of

Water and Power was established. The following year it took over all the functions of the Iran Electricity Authority and in addition integrated all electric power utility services on a nationwide basis. The nationwide integration of electric power services introduced entirely new concepts of the scope of power system growth and development."

II. Memorandum from Dick E. Hart, Executive Engineer, Detroit Edison Co., 2-14-72

"The Electric Power Industry Survey in Iran was precipitated by a request in July 1965, which came from Howard Parsons, at that time U.S. A.I.D. Mission Director in Iran. Howard had come from Taiwan, where he was U.S. A.I.D. Mission Director about a year earlier. Since Howard had such an effective experience with an Electric Power Industry Survey team under the Chairmanship of J. B. Thomas in Taiwan in 1963 (which had been organized and guided by Mr. Walker Cisler, Chairman of the Board of the Detroit Edison Co.), he was interested in doing a similar task in Iran. His purposes were twofold: (1) to provide a power industry survey which would set forth sound expansion plans for the emerging power industry in Iran, and (2) to provide a broad study which would further cooperation among the various government organizations concerned, including the Plan Organization, the Ministry of Finance, the Ministry of Water and Power, and the Ministry of Agriculture.

"Therefore, in July of 1965 while Walker Cisler was visiting with Howard Parsons, Howard placed a tentative request with Walker that he recruit a team of electric power industry specialists to carry on a broad study. Based on this request, I prepared a short description of an Electric Power Industry Survey for Iran, which would be undertaken in two phases. Phase I of the Survey would encompass the examination of all data available on energy sources, electric power supply, recent electric power industry engineering and management studies and existing power-related government policy and regulation. Based on the Phase I study, recommendations were to be made for Phase II studies-in-depth to include: (1) a total energy survey, (2) a system planning study, (3) a capital expenditure and financing program, (4) cost of service and rate studies, (5) regulatory law and commission studies, (6) management and organization studies, and (7) related studies.

"Phase II of the Survey was to study in depth the related component power supply industry studies recommended in Phase I. These studies were to be of sufficient detail so as to provide recommendations which were specific in nature. The immediate implementation of the recommendations was to lead to early and definable improvement and progress in the power industry. You will find a rather detailed description of the initial definition of electric power industry survey for Iran included in Attachment A.[1]

"Following the submission of this Study Outline to Washington, U.S. A.I.D., I was asked to pay a visit to Iran, where I discussed, at some length, the matter of a power survey with Iranian managers and government officials. I spent about 5 days in mid-November, 1965, with the Plan Organization, Ministry of Water and Power and U.S. A.I.D., Iran. Together we were able to

[1] Available in A.I.D. (TA/STS).

forge a reasonably good understanding of what an electric power industry survey should be for Iran. This was a genuinely cooperative exercise. The tentative agreements arrived at with Iranian officials are included in Attachment B,[1] which is a letter I sent to Walker Cisler on November 22, 1965, from Tehran. The letter pointed out that the Power Team was to encourage prudent electric power planning and construction and to inculcate time-proven management practices and principles. 'The Chairman of the Team must, therefore, be a man of great competence and diplomacy. Furthermore, he must be on station in Iran for the whole time. To have a man here only part time is not going to be adequate.'

"Following my return to the States and by January of 1966, I had prepared an Electric Power Industry Survey descriptive outline, setting out a Two-Phase Study (Attachment C).[1] The philosophy of the Two-Phase Study was based on determining specifically what the conditions were in Iran; the availability of data; and the competency of the managers in the Electric Power Industry to implement the recommendations of any study which we might make. Phase II was to carefully perform indepth studies of those areas that were agreed to be problems by the industry. The agreement would be a mutual one between the Power Survey Team and the Managers of the Iranian Electric Power Industry. Furthermore in Phase II, there were to be careful counterpart arrangements where the specialists on the Power Team were to have men from the Iran Electric Power Industry who were highly placed and whose positions in the Industry were identical to those of our consultants. It was emphasized from the outset that the counterpart managers from the Iranian Electric Power Industry were to be directly involved in Phase II, assisting in developing conclusions and being a part of the procedure whereby recommendations were made to the Ministry of Water and Power.

"The Phase I Report was submitted on June 1, 1966, to the U.S. A.I.D. Mission in Tehran by the Chairman, Charles E. Oakes, formerly the Chairman of the Board, Pennsylvania Power & Light. This Report is entitled 'Iran Electric Power Industry Survey, Phase I Report.' Its recommendations were accepted both by U.S. A.I.D. and the Iranian Government and a Phase II Study Scope was defined. This was submitted to Washington/U.S. A.I.D. on July 1, 1966, and appears as Attachment D[1] to this letter. Phase II study work began in mid-July, 1966, and concluded by mid-December, 1966. The Phase II Power Industry Survey Team was chaired by James Clawson, former Chairman of the Board of Puget Sound Power & Light. You will note that again a strong emphasis was made on the participation of managers from the Iranian Power Industry in the work. I quote from page 6 of Attachment D:

> If the problem solutions flowing out of Phase II are to be effectively implemented, designated managers from the electric power industry in Iran should participate in developing the problem solutions. The experience gained in Phase I—Team Specialist with Counterpart Member, indicates that this should lead to the achievement of the required mutuality in problem solving during Phase II. Each Power Team Specialist in Phase II must endeavor to maintain this rapport which will be essen-

[1] Available in A.I.D. (TA/STS).

tial to the ultimate commitment to implementation by the managers of the electric power industry in Iran.

"The Phase II Report was completed on December 14, 1966, and submitted by Chairman J. H. Clawson to U.S. A.I.D. in Tehran. In the introduction to that Report, it was stated that:

> The overall objectives of the Iran Electric Power Industry Survey have been (a) to make recommendations which will lead to a more efficient and effective electric power industry organization, (b) to outline a system development program to meet the projected demands over a period of 20 years, and (c) to determine a financial program which will lead to the industry's credit-worthiness.

"After careful discussion of the Phase II Report with the Ministry of Water and Power and Plan Organization in Tehran from December 15 through December 20, 1966, it was determined that the work on organization and management, finance and accounting, review and analysis, and rates and regulation, was satisfactory to the Iranian Government. However, the work on load forecasting and electric power system development was considered unsatisfactory, since the load predictions were felt by the Iranians to be much too pessimistic. The concerns expressed by the Iranian officials are outlined in greater detail in Attachment E.[1] The need for a Supplemental Study and what it might include was also defined in Attachment E.

"After a series of discussions, both with the Ministry of Water and Poser and U.S. A.I.D./Washington, it was possible to reach an agreement on a Supplemental Study. The Supplemental Study began in February of 1967 and consisted of a very intense and well-organized data gathering segment and a data analysis exercise prior to developing a new load forecast upon which a new system development plan and capital expenditure prediction was to be based. The Harza Engineering Co., already engaged by the Ministry of Water and Power in a consulting management program, assisted in the implementation of the data gathering segment of the Supplemental Study.

"The supplemental Study was completed in July of 1967 and submitted in two volumes by J. H. Clawson, Chairman, on July 6, 1967. Volume I was entitled, 'System Development,' and Volume II was entitled, 'Management, Organization and Finance.' Both of these volumes were received with great acclamation by Iranian power interests and proved to be a very satisfactory experience for the Supplemental Electric Power Industry Survey Team. The Supplemental Team was able to achieve the desired rapport with the managers of the Iranian Power Industry in the course of its work, and as a result, there was a mutuality in the recommendations made to both the Iranian Government and U.S. A.I.D. for the future development of the power industry in Iran.

"The Supplemental Study Report, in its two volumes, was received with such acclaim in Iran that it has been referred to repeatedly by Iranians as typical of the sort of consulting effort that they would like to see undertaken in other areas of industry and agriculture in Iran. The work did, in fact, lead to the General Manager of the Tehran Regional Electric Power Co. calling upon the U.S. investor-owned power industry in June of 1969 to assist him in

[1] Available in A.I.D. (TA/STS).

undertaking a detailed management study within the Company. Edison Electric Institute responded by sending four middle-managers to Iran whose entire living expense, transportation and salary was paid by the Tehran Regional Electric Power Co. General Manager Salehi refers most favorably to this subsequent experience with the American power industry managers. In fact, he currently is endeavoring to set up a development program for senior officers and middle-managers from the Tehran Regional Electric Company in the United States. A total of some 100 managers would be given a development and training experience over a period of 4 years. Currently, negotiations are underway through Walker Cisler to develop such a program.

"The Iranians consider Mr. Cisler's continuing guidance of the work—from lining up the right experts in the United States to periodic visits to Iran to review progress with high Government officials—as a vital element in the success of the Electric Power Industry Survey in Iran."

III. Memorandum from F. von Voightländer, Project Manager, Harza Engineering Co., 1-17-72

"There being no background in Iran for the management and operation of large electric power systems, the Ministry of Water and Power at the suggestion of the U.S. A.I.D. Mission in Tehran sought assistance from international consultants and on 5 June 1966 concluded arrangements with Harza Engineering Co. of the United States to provide management consulting services for implementing the recommendations of the Power Survey Team. This work was begun in the 4th Quarter of 1966. The U.S. A.I.D. though then preparing to phase out in Iran, agreed to fund the dollar portion of the Harza Utility Management Project and the contract was amended 7 March 1967 to provide for this. Subsequently the contract was amended several times to increase the scope and depth of this Project and to extend it to 1 March 1973.

"The services performed under this Project are principally in the fields of Accounting and Financial Management, Economics and Tariffs, Personnel and Training, and Engineering. A comprehensive program of work with emphasis on the participation of Iranian counterparts has been undertaken in all these fields. Quarterly reports of the activities are regularly rendered with copies to all concerned in addition to more detailed bilingual monthly reports.

"The principal accomplishments of the Project to date are the establishment of the Uniform System of Accounts and related improved business procedures in all Regional and Affiliated companies of the Ministry, the establishment of improved tariffs for all operating companies, the executive management training program with its home study courses and the summer training programs in the United States, the establishment of the Manpower Development Institute and its related personnel training programs, the establishment of engineering codes and standards for design and construction, and the many services rendered to the Ministry and affiliated company staff by the highly qualified specialists of the Project.

"To implement the distribution system development recommended for the principal load centers by the reports of Gilbert Associates, mentioned above, and by others, distribution development projects were assigned to several consultants including Kuljian Engineers of the United States. During this period the General Electric Co. of the United States was awarded substantial business for the supply and erection of two 12,500-kw gas turbine driven generators of the Tarasht Power Station in Tehran (1965-66), three 82,500-kw steam turbine driven generators at Farahabad in Tehran (1965-67), and is currently working on four 156,000-kw steam turbine driven generators at Shahryar, 35 km west of Tehran, one of which is now in trial operation. The Ex-Im Bank of the United States assisted importantly in the financing of these projects. The Harza Engineering Co. International of the United States was assigned the engineering work for the 1,000,000-kw hydroelectric development on the Karun River (Reza Shah Kabir Project) in Khuzestan, including the related 400 kv transmission system and irrigation development, as well as the dam and irrigation development of the Marun River also in Khuzestan.

"From the foregoing it will be seen that there has been considerable participation by American organizations in the power development program of Iran. With average annual load growths of from 30 to 40%, the power requirements in Iran double every 3 years. At the end of the current Fourth Plan (20 March 1973) the maximum demand of the system including the non-interconnected areas will exceed 1500 MW with annual energy requirements of 7000 Gwh. Such a load growth pattern requires a continuous program of development of generation, transmission, distribution and communications systems of substantial magnitude for the forseeable future. For the Fifth Plan period (1973-78) the capital additions alone will need to average about U.S. $100 million per year for this system, making it an enterprise of substantial dimensions."

Appendix 10

City and Regional Planning

M. D. Kilbridge

Present Condition

In matters of city and regional planning the Government of Iran seems to be quite clear-minded and coherent, at least at the policy level. The general framework of an urbanization policy has been adopted that emphasizes the location of industry, to my mind the proper starting point. The plan is to locate industry, to the extent this is economically feasible, throughout the 11 regions to achieve balanced development and population growth in cities other than Tehran. Industries are no longer allowed to locate in or near Tehran.

At the same time the Plan Organization, through its Regional Planning Department, is, or intends to be, engaged in comprehensive regional planning for each region. Sectoral plans are submitted to it by the other Departments of the Plan Organization for location decisions. When an industry is to be located at other than the most economical location, an estimate of the cost of this suboptimization is prepared and the decision made with this in mind. Each regional plan is, or is to be, done with the help of a consulting firm. Only three of the 11 regional contracts have been let (to Bechtel, a French, and a Dutch firm). The remaining eight are to go out for proposals within a year, I am told. The Battelle organization has been given the task of suggesting methods and models for comparing and compositing these plans. Among its functions, it is to see that the plans are prepared with standard formats and common denominators so that they can be composited when finished. This is a very difficult task.

The agencies for city and regional planning exist within the Government of Iran and appear to be well-considered structurally and properly articulated. The Plan Organization has a Regional Planning Department and an Urban Development Department. Each of the 11 regions has, or is to have, a Regional Planning Office, which will be the home and the counterpart organization for the eleven consulting groups.

A population control program is being actively discussed with support at the highest levels. There is every reason to expect achievement on this front eventually and it is essential, of course, as an adjunct to any urbanization policy. All in all, the Government of Iran seems to know where it is going in matters of city and regional planning (in contrast to planning for low-cost

housing) and the real question is whether it has the professional manpower to get there. The problem will be going from general objectives to specific programs and implementation because of the lack of middle management and competent city and regional planners in anything like the required numbers.

U.S. Interests

As with most areas of economic development, the prevention of social unrest and achievement of political stability through balanced city and regional development is in the U.S. long-run political interest. The Government is as well aware of this need as we and I see little we can do to assist them. Competent, experienced, nonacademic planners are also scarce in the United States. Some top-level consultants to the Government of Iran, perhaps in the Department of Regional Planning, could be marginally useful.

As concerns U.S. economic interests, they are minimal. Few commercial products are involved and the consulting opportunities available, while attractive, will not be large.

Increasing Technical Cooperation

There are now about 25 Peace Corps Volunteers involved in this work in Iran and the Government of Iran has contracts with Victor Gruen (L. A.), Bechtel, and Battelle. This number could perhaps be doubled by proper representations to the Plan Organization. Beyond this, little opportunity seems to exist for increasing technical cooperation on a nonconcessional basis, and little argument can be made for doing so on a concessional basis.

Appendix 11

Industrial Development

M. D. Kilbridge

Present Condition

Industrial development has flourished during the period of the Fourth Plan (1968-72), increasing at a rate of more than 13% a year. In 1971 industrial production, excluding oil, accounted for about 10.5% of the GNP. Preferential treatment in the availability of foreign exchange, protected markets, a favorable climate for foreign private investment, and innate entrepreneurial skill among Iranian businessmen, have combined to bring Iran, in a very short period, from an agricultural to a mixed agricultural/industrial economy.

A large part of this development has taken place in the public sector through agencies such as the Iranian Industrial Development and Renovation Organization (IIDRO) which itself owns and operates 14 large factories, including aluminum, textiles and machine tools. By one estimate, the GOI now owns and operates more than 50% of the Nation's industrial capacity, excluding oil. Although government has entered some fields for the purpose of spurring development, unfortunately, once in, there is a tendency to stay and to encroach further. This worries and annoys private industrialists who feel they are suffering unfair competition and that, left alone, they gladly would have taken on much of what government has done.

U.S. National Interests

The United States has, naturally, a strong political and strategic interest in the sound industrial development of Iran. In addition to the usual reasons for desiring the economic growth and political stability of a friendly developing nation, there is the special strategic consideration of Iran's being able to supply its own essential needs, both civilian and military, in the event of hostilities. These interests are shared, however, by the NATO countries and are not particular to the United States. Technical industrial cooperation by anyone thus serves the purpose of all.

Commercial interests are another matter. In this realm we are competing with European nations and Japan to establish joint ventures and to sell plant and raw and intermediate materials to Iran. The industrial establishment of

Iran is now a polyglot encampment of various equity, managerial, and technical cooperation arrangements in which the United States is by no means dominant. Relative to several other nations, the U.S. involvement and presence is diminishing. Our share of the market, as it were, is declining as the advantage we enjoyed a decade ago is eroded by U.S. price increases and the growing technical competence of other nations. U.S. equipment and materials are generally more expensive than those of European nations and Japan because of higher initial costs and longer shipping routes. U.S. consulting services from the nonprofit sector generally cost Iran about 50% more than British and Western European services, and from the private consulting sector the cost is almost double. Iranian preference for U.S. technical services at a premium price, to the extent such preference still exists, stems from a general belief that U.S. advisors can be trusted (especially those from the public and nonprofit sectors) and that U.S. technology is the most advanced. This favorable bias cannot long survive the unfavorable cost differential. Either there must be a great deal of sales effort on our part or the introduction of some means to mitigate cost differences.

Adding to the problem are the U.S.-based multinational cooperations and consulting firms. The manufacturing corporations provide equipment and materials to Iran from world markets. U.S. consulting firms with European affiliates operate out of those countries into Iran. Like the multinational manufacturer, they use American ideas and methods, but employ European and host country technicians and in other ways seek factor economies on a world basis. Given the price disadvantage, the market for U.S. technical services, at cost, is weakening rapidly and special efforts will be required to strengthen it.

Increasing Technical Cooperation

To a greater or lesser extent, depending on the specific industry and other factors, sales opportunities for U.S. equipment and materials are enhanced by the presence of U.S. technical advisors. This seems to be less so in the private than the public sector. Iranian industrialists, in general, are too knowledgeable and cost conscious to buy on the basis of personal contacts only, or the recommendations of interested parties. They buy in world markets with some sophistication on the basis of cost and availability. The public industry sector, being less cost conscious and more concerned with durability and quality is a potentially better market for U.S. products. Since the public sector, excluding oil, owns about 50% of Iranian industry it would also serve U.S. interests to meet GOI requests for technical consultants at high-level places in the Ministry of Economy and IIDRO. The small-scale sector is not, at this time, an interesting market for U.S. equipment.

One quickly gets the impression that other country embassies, especially the British and French, provide far more specific and practical help to their business communities seeking commercial opportunities in Iran than does the U.S. Embassy. This is not a criticism of the Embassy staff, but a comment on the greater commitment to this kind of activity on the part of other nations and perhaps to the greater rapport between their business and government

communities. Yet, although there is room for improved communications in commercial matters, I have the impression that most of the Iranians who make the decisions have good contacts. We should, perhaps, be concerned about keeping these contacts fresh and timely and a service to do so might be indicated, but, in my judgement, it will not make a substantial difference in the volume of services purchased as long as the price differential remains.

Appendix 12

Infrastructure for Support of Industrial Technology

E. L. Brady

I. Industrial Technologies Important to Iran's Economy

Industrialization has proceeded rapidly in Iran during each of the 5-year economic plans followed so far. Overall, the increased output of manufactured products is impressive and in some sectors has been quite remarkable, even after allowance is made for large uncertainties in performance statistics. Government figures[1] show that sales of Iranian industrial products rose from 51.7 billion rials ($678 million) in the 1959-60 fiscal year to 201.6 billion rials ($2.64 billion) in the 1966-67 fiscal year; an increase of approximately fourfold in 7 years. The overall figure for the current fiscal year is not available but government officials claim that the rate of increase has been maintained, or even accelerated. For some types of products, sales figures show greater growth as illustrated below:

Product	Sales in 1959–60 (Millions of dollars)	Sales in 1966–67 (Millions of dollars)
Machine tools	.83	7.8
Electrical equipment	2.29	38.8
Motor vehicles	20.0	130.2

Output of chemicals has grown at the average rate, increasing from sales of $20 to $82.7 million. Manufacture of home appliances, needed by a middle class growing rapidly in numbers and affluence, has increased enormously—in 1969-70 reaching 177,000 refrigerators, 50,000 air conditioners, 170,000 gas stoves, and 70,000 television sets. The figures for refrigerators and stoves correspond to approximately one of each for every 30 families.

The major industrial operation of Iran is oil production and refining. It accounts for 90% of the dollar volume of export sales and gives Iran the foreign currency that fuels most of its development program. Most of Iran's oil production and refining is carried on by a consortium of the major oil companies of the world which bring to Iran the high level of skills and technology of their worldwide operations.

However, significant contributions to the economy of Iran are made by

[1] Statistics obtained from Iran Almanac and Book of Facts, 10th Edition, published by The Echo of Iran, Tehran, Iran, 1971.

low-technology operations. The manufacture of carpets, furniture, and jewelry has probably not changed for hundreds of years. Many other manufacturing industries have made some progress toward modernization but more will be needed before they can be said to be at the forefront of new technology. This is not intended to imply advocacy of new technology throughout as soon as possible but is intended to imply that situations favorable for the use of new technology abound in the economy.

The Plan Organization considers that the rate of industrial development is satisfactory and intends to give this area of the economy relatively little attention during the next 5-year plan. Higher priority has been given to agriculture, mineral resources, water resources, and education.

Clearly then, the industrial part of the economy of Iran is rapidly evolving, is characterized by a mix of high- and low-technology activities, and covers a wide range of consumer and industrial products. If development of this sector is to continue, and if Iran is to rely on its own resources of individual and institutional capabilities to ensure such development, an infrastructure of services and facilities is required. The components of this infrastructure involve education, technological research, transportation, communication, and other sectors. Iran's infrastructure is weak in several ways and is at present not fully adequate to support a high-technology development program. The principal issue in the development of low-technology industry is diffusion of new techniques to the industry, rather than the development of the new technique itself; and different segments of the infrastructure are involved. Several aspects of the infrastructure problems are discussed below.

II. Sources of Technology Used in Iran

All of the Iranian high-technology industries studied by the team have understandably relied very heavily on non-Iranian sources for their technology. Automobile assembly, paper manufacture, oil refining, plastics manufacture, home appliance manufacture—all employ basic procedures provided by a partner or a licensor in a more strongly industrialized country. In some cases small design changes have been required; for example, changing the size and shape of a refrigerator to fit Iranian kitchens (or living rooms) more comfortably. Multinational companies are active in Iran, relying upon nearby branches of their own companies to provide whatever technical consultation may be required by their Iranian partners or licensees.

In the lower technology areas of Iranian industry the origin of the technology is untraceable. In some cases where the technology has not changed for hundreds of years (e.g., carpet making), the origin is not only lost but is irrelevant. The kerosene fueled, Welsbach mantle light source frequently used for outdoor and bazaar illumination was invented in Germany more than a hundred years ago and has since spread all over the world. As electrification spreads, its importance diminishes.

The Government of Iran has established an institution to promote innovation in low-technology industry—the Institution for Standards and Industrial

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Research of Iran (ISIRI). It is too soon to judge how effective this organization will become in this field, (See sec. III.), but its present program seems well balanced and promising.

III. Industrial Research

Two laboratories have been established in Iran whose mission is industrial research—the central research laboratory of the National Iranian Oil Corp. (NIOC) and the Institute for Standards and Industrial Research of the Ministry of Economy. Both of these laboratories are just beginning their research programs and have not yet produced results of major importance. Of the two, the NIOC laboratory has the greater resources in facilities, equipment, and staff, necessarily so, since its mission is directed toward solving problems of greater technical complexity, being concerned with product development and application in the petroleum and petrochemical field, while the ISIRI laboratory concerns itself with product and process development in the lower technology textile, ceramic, and leather industries.

There was no mention of any other industrial research facility in any of our discussions. Industrialists claimed that their affiliates in the United States, Germany, Japan, or other countries, supplied all the new technology they needed. Research is an expensive gamble and they propose to depend on their parent companies.

IV. Universities

Universities can, in principle, carry out two functions as part of the supporting infrastructure for technological industry in a country—supplying qualified engineers, scientists, managers, and other professionals to run the organizations, and conducting research and development in their own facilities upon request or under contract. The education of qualified professionals is one of the principal tasks of the universities, and considerable effort is devoted to such training programs. Industrialists seem uniformly to prefer Iranians who have been educated in the West, especially in the United States. They say that a major difference between a Western-educated and an Iran-educated Iranian engineer is in their attitudes toward work. The Iranian-educated engineer may be less inclined "to start at the bottom" than the Western-educated engineer. (This statement of preference for Western education may to some extent reflect courtesy to the Western visitor.) The result, according to these industrialists is that the Western-educated Iranian engineer may be immediately useful to his employer while the Iranian-educated may first need a break-in and indoctrination period.

All industrialists with whom the subject was discussed seemed to have great hopes for Arya Mehr University. The school has developed a good reputation, even though only two classes have graduated. The university authorities seem thoroughly familiar with the problem of student attitudes and plan to provide appropriate training.

Another type of trained manpower needed by industry is managers and

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business administrators. Almost invariably the persons occupying top-level positions of these types have been trained in the United States or Western Europe, with a strong preference expressed for the United States. The Iran Development and Renovation Corporation (IDRC), a government-owned managing corporation that operates 14 manufacturing plants in Iran, has instituted a training program for both high-level managers and intermediate-level administrators. Working with A. D. Little and the Harvard Business School, the Industrial Management Institute (IMI), the management consulting arm of IDRC, has established a training program for managers which is capable of accepting 25 men of proven ability in each session. The program is now operated in Cambridge but is soon to be transferred to Tehran, with Iranian instructors for most, but not all, of the courses. IMI also conducts courses in Farsi at intermediate level in subjects such as accounting, computer programming, statistics, etc. Almost 2,000 persons per year take these courses.

Only recently have efforts been made to couple research capabilities at the universities with industrial problems. Tehran University has canvassed industry requesting that problems be identified that the departments and institutes might tackle. Conflicting opinions were expressed to the team on industry's response. But even if this experiment does not immediately produce results useful to the universities and to industry, the additional information that will be obtained on the nature of the relationships between industry and the universities may ultimately be helpful in adjusting those relationships.

V. Industrial Quality Control

Since Iran's high-technology industry is brought into the country by license or by affiliation with a multinational company, quality control of the products is exercised by that company in order to protect its name and reputation. For example, the Kleenex licensee in Tehran must send monthly samples of his product to Neenah, Wisconsin, for examination by Kimberly-Clark, Inc., the licensor. Presumably Kimberly-Clark also sends quality control inspectors to his plant at less-frequent intervals. Generally, Iranian industrialists seem to find no problems in satisfying the demanding standards of the parent companies.

For indigenous, low-technology industry, the situation is quite different. To satisfy the consumer demand for uniform and measurable quality and to expand and protect the export market, the Ministry of Economy operates the Institute for Standards and Industrial Research of Iran (ISIRI). Two standardization and quality control programs are operated, one voluntary and the other compulsory. Under the voluntary program, any manufacturer who wishes to may undertake to satisfy the quality standards set for his product and may then display the certification of ISIRI on his product. Eventually the seal of ISIRI will come to be regarded as a sign of good quality, but it has not yet achieved full recognition. The seal is primarily of benefit to low-technology industry and agriculture, since high-technology industries consider their brand names adequately regarded at present as symbols of quality. Moreover, since industry is charged a fee for the use of the seal, only a small

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number of manufacturing firms (60–70) have considered association with the program to be cost-effective.

ISIRI also operates a voluntary hallmark system for gold and silver articles, checking the content of items submitted to it and stamping the item with a symbol indicating the noble metal content. Two levels for each metal are used: for 14 and 18K gold, and for 84 and 90% silver. This system is soon to become compulsory, but enforcement problems are likely to be encountered.

Compulsory quality standards are applied to a number of manufactured articles for which the safety or the welfare of the public must be protected or which are destined for export to countries accepting only reliable products. In principle then, ISIRI can exert powerful influences to upgrade and to control the quality of manufactured products in Iran.

As Iran's export trade grows, the importance of compatibility with international standards will grow. ISIRI represents Iran in international standardizing bodies, such as the International Organization for Standards and the International Electrotechnical Commission, and bases many of its national standards on the recommendations of these bodies. The ability to remain competitive in world trade requires Iran, and other developing countries, to know and to meet standards that have been adopted internationally for the products it wishes to sell. ISIRI is the official mechanism to guide industry in these matters and prudent consideration for future needs would indicate that ISIRI and its technical program should receive adequate resources and ministerial attention.

The U.S. Government agency most closely corresponding to ISIRI is the National Bureau of Standards (NBS), though there are major differences in emphasis in the programs of the two agencies. While the mission of ISIRI includes responsibility for writing product and process standards and administering the export quality control system of the nation, as well as responsibility for new product and process development for industrial application in Iran, NBS is not charged with these same responsibilities. It is nevertheless the most appropriate organization to enter into a cooperative relationship with ISIRI. During the present team visit to Iran, the Director of NBS, who was leader of the U.S. team, and the Director of ISIRI established a cordial relationship. ISIRI was assured that NBS would respond to requests for technical assistance, supplying NBS staff members if appropriate expertise could be found at NBS and helping to locate specialists outside NBS if necessary. The Director of ISIRI indicated that his organization would expect to pay for any technical advice received and had the resources to do so.

VI. Statistical Information

The Statistics Center of the Plan Organization has responsibility for gathering and analyzing economic and demographic statistics relating to the performance of the economy, population trends, and other social phenomena. Considerable reliance is apparently placed on banks and other financial institutions for financial statistics. Such statistical analyses are an essential infrastructure service for technological industry, just as they are for other sec-

tors of society. The U.S. Census Bureau has helped to train many members of the staff of the Statistics Center. Close contact is retained, and the Census Bureau representative who briefed the team in Washington apparently had a high opinion of the technical qualifications of the Iranian staff. Nevertheless, statistics can be no better than the input data and here Iranian statistics are weak. Collecting reliable data is difficult enough in a sophisticated business and industrial community that appreciates the value of good statistics. Collecting data from a business community that is not yet at this level of sophistication is much more difficult. Data processing is competent and the statistical results are useful, but one must realize that the uncertainty limits are wide.

VII. Scientific and Technological Literature

If a nation is to achieve an independent capability for technological advance, including the development of new products and processes, its scientists and engineers must be able to learn what has already been done in other countries. An essential element, therefore, of a technologically innovative society is accessibility to the world's technical literature. In Iran the availability of the world literature seems greater than its usage. However, the high-technology industry of Iran receives its technology from outside sources and presumably does have the necessary familiarity with world developments.

The major universities in Iran apparently have adequate technical libraries with good collections of both books and journals. For example, the study team was informed that the library of Arya Mehr University received more than 2,000 journals (not complete back files, however) and contained about 20,000 volumes. The library of Tehran University is the largest in the country, containing more than 400,000 volumes, but this library is concerned primarily with literature and law.

Industry, whether high technology or low technology, shows no urge to consult the literature—with one exception, the National Iranian Oil Co. This is probably the only industrial organization in Iran which possesses its own technical library and, by all accounts, it is a good one.

The most significant current technical literature collection in Iran is the Iran Documentation Center (Irandoc), established in 1968 as an arm of the Institute for Planning and Research of the Ministry of Science and Higher Education. Irandoc receives approximately 6,000 periodicals in the physical, engineering, and social sciences. It receives 150 abstracting and indexing journals, including all the major ones in the English language. These 150 journals constitute about half of the world title list in this field. Its Director and staff are familiar with the services provided by the National Technical Information Services (NTIS) of the Department of Commerce, but rarely are called upon for information obtainable from NTIS. Despite its resources and its value as a source of information, however, Irandoc seems to be little known and is used as yet only by a small number of government and academic people. It suffers from the common ailments of documentation centers—its potential customers don't know enough about it and when they do they are reluctant to pay even the modest fees that are charged.

VIII. Other Aspects of the Infrastructure Not Examined

A complete study of the infrastructure for support of technological industry would have included examinations of the national system for transport and distribution of goods, the communication system, the patent and copyright system, selected aspects of the legal system, and relevant government policy. These matters were not examined in any detail, but a few comments on government policy follow.

The Government of Iran is a direct participant in industrial enterprise, not only in the oil industry but also in such areas as aluminum, steel, and machine tool manufacture. Private entrepreneurs point out that in some industries this may reduce the incentive for innovative risk taking, that government may stay in a business longer than necessary, and that government corporations may be less "cost conscious" and "profit-motivated" than private firms.

Another policy of the Government is to protect domestic industry by controlling imports of competitive items. A firm benefiting from this protection may not have the incentive for improved efficiency that competition would bring.

Finally, the Government has a policy of encouraging domestic manufacture of items to substitute for imports.

National Housing Policy

M. D. Kilbridge

The need for governments to take action directed toward the proper housing of large groups of society is a relatively recent phenomenon closely related to urbanization. The more rapid the process of urbanization, the more urgent the need, since a high rate of urban growth almost always results from the migration of low-income groups from rural areas. Frequently these cannot find jobs, or sufficiently well paid jobs to pay the rent of adequate housing. The majority therefore have to share overcrowded and unhealthy accommodations with other families and some have no home at all. As the process continues, densities increase and areas which never had the utilities required by high-density housing become dangerously unhealthy. The problem tends to cause social unrest and the longer it continues the greater the expenditure of municipal funds required to solve it.

In some Eastern cities, Calcutta being the extreme example, the situation has deteriorated to the point where neither municipal nor national governments can foresee any solution within the capability of their national economies. In Tehran, the problem is not yet so acute but, beyond question, it does already exist. In-migration to the city continues at a high rate while densities have exceeded the levels indicated by minimum public health standards.

The Central Policy Issues

A national housing policy will have to address the following issues, most of which have been extensively discussed in Iran, and some of which have had partial resolution.

They must be resolved consistently and as a whole, however, before a national policy useful for programming purposes emerges. It is essential that any housing programs undertaken be at least as vigorously pursued in other cities as in Tehran. It would be a great mistake to increase the relative attractiveness of Tehran by engaging in a housing development program for the capital city alone.

1. Can the growth of Tehran be limited or slowed?

Its population now is almost 3.1 million and growing at a rate of 5-6% annually, of which more than half is in-migration. Without government action,

projections suggest 12 to 16 million inhabitants by 1991. Government policy is to limit the growth to 5.5 million by 1991, which seems unrealistically low, since internal growth alone will achieve this. If growth is to be slowed drastically, it will require a national urbanization program involving at least the following kinds of action:

(1) Prohibiting the location of new industry in or near Tehran.

(2) Providing employment opportunities in other cities or "growth poles" as counter-magnets to Tehran.

(3) Providing public supported housing in other cities equal to or better than that to be provided in Tehran.

(4) Control of the city land to prevent illegal construction or squatter colonies.

2. Projections of demand.

To formulate policy it will be necessary to estimate future demand and set national goals. Population projections for the various cities exist as part of the Fourth Plan, based on managed in-migration consistent with the Government's urbanization policy. It will be necessary also to project family incomes for the same period and to estimate the number of families that will not be able to secure adequate housing in the open market.

3. Development of national housing standards.

A national housing program will have to be based on generally accepted standards of cost, facilities and space, construction specifications, population density, hygiene, etc. Without such standards, projections of demand or goals are useless, yet this development is extremely difficult, involving critical social and cultural judgments.

4. Should industrialized housing be tried?

This might be a situation in which mass-produced elements, made off-site, could work. The Italians and Dutch have done it in somewhat similar circumstances.

5. Government or private implementation?

This question involves a whole series of issues concerning methods of implementation. Should the Government build housing itself, or provide subsidies and incentives to the private sector? Should the Government own and rent housing, or should it sell to private individuals? What form should government subsidies take? What agencies of government should be involved? A wide variety of financial and institutional arrangements have been worked out in other countries. These should be surveyed to select the ones most appropriate for adaptation to Iran.

6. Should industry be required to house its own workers?

This is the pattern in some developing countries and is applicable to the large-scale organized industrial sector, especially new establishments. It shifts the housing burden from municipal governments to industry and distorts production costs, but viewed from the national economic viewpoint it may be more efficient.

7. Is high-rise development the solution for low-income housing?

This is a critical issue on which the whole government housing effort may founder. Low-income high-rise apartments have been almost uniformly unsuccessful in both the United States and United Kingdom. There is no need for Iran to repeat our mistakes. Yet there is talk here of the high-rise solution. At the same time, some in the Ministry and elsewhere admit to the strong Iranian preference for single unit housing and to the inadaptability of peasant in-migrants to apartment living. There is also some recognition of the earthquake dangers of high-rise. When these special considerations are added to the universal complaints about high-rise apartments for low-income groups, there is reason to believe that high-rise could be a terrible mistake. There are other solutions to density requirement than high-rise, including many forms of "garden apartments" developed in Britain.

Potential for U.S. Consulting Service

A host of fragmentary efforts, mostly short and minor, have been made or are underway involving "experts" from several countries, including the United States, both public and private. None have been adequate to the need. This is a massive job requiring sustained and concerted effort.

The British could do it as well as we since they have long experience with public housing and their social philosophy of housing is probably more like Iran's than ours. If industrialized housing is to be seriously considered, the Italians, Dutch, or Swedes have considerable experience. Considering the policy issues as a whole, however, I believe that U.S. consultants with experience in dealing with the Housing Act of 1968 and general backgrounds in urban planning could perform well in this role.

Appendix 14

A.I.D. in Iran in Retrospect

M. D. Kilbridge

Introductory

The Agency for International Development closed out its operations in Iran in late 1967 on the grounds that Iran no longer qualified for concessional aid from the United States. The criteria by which this decision was made are not clear to us exactly, but we assume the availability of foreign exchange from oil revenues and a certain sustained rate and level of economic growth were the essential factors. Among the terms of reference given the Technical Cooperation Survey Team was that we analyze past A.I.D./Iran activities.

The Team did not attempt to make a thorough survey of A.I.D. in any sense of that word. We had neither the time nor the inclination, since we felt that to plan for the future should have a higher priority than to evaluate the past. Also the Team was not competent in all areas of A.I.D./Iran past activities. We made no attempt systematically to trace individual A.I.D. projects back through history. We did ask the Iranian officials with whom we talked if they could give us their impressions of the A.I.D. program and what remained from it. Therefore, what is reported in this section is impressionistic and highly fragmentary.

Our questions about A.I.D.—what it had accomplished and what it had left behind—were directed mostly to middle- and top-level officials of the Government of Iran in the Ministries, Departments of the Plan Organization and to university administrators. Also, our discussions took place mostly in Tehran, not in the countryside, so it is possible that A.I.D. extension-like programs are under-represented and undervaluated in the reactions received.

The Team's experience in Iran has convinced us that it would be well in the future to make thorough and objective reviews and evaluations of technical assistance programs at several historical points; say, after five and again after 10 years. This is desirable not only to help us understand more of the nature of technical assistance and to learn from our successes and failures, but also to link later day non-concessional technical cooperation to the institutions and programs initiated by A.I.D. We also feel that it would be well for A.I.D. recipient nations to remember our efforts. A survey serves as such a reminder. Gratitude should not be expected, but historical awareness should be.

General Impressions

The Team's consensus seems to be that, with some exceptions, A.I.D. has not left very strong impressions in the minds of the Iranians with whom we spoke. Even the traditional Iranian politeness and diplomacy could not disguise the lack of ready response to our questions about the results of A.I.D. which, when forthcoming, generally were neither enthusiastic nor deprecative. Many persons had to think twice before recalling what A.I.D. had been involved in. There were some embarrassingly long periods of recall. None said that A.I.D. had made a critical difference in the earlier stages of Iranian development. Spontaneous statements of appreciation were lacking.

It should be recognized, however, that the lack of visible traces of foreign assistance does not necessarily mean that the technical assistance program was unsuccessful. Quite the opposite could be the case. A good technical advisor keeps a low profile and subordinates his presence and personality to his host country counterpart. He floats ideas softly and selflessly, ideally to be accepted by those he advises as their own. As a pure catalyst he precipitates reactions without entering into them. An institution or program thus launched might carry on very successfully while the true nature of its origins are lost, and well enough so. But the institution or program should remain and perform as planned. This is a measure of success.

When the Iranians were pressed to recall A.I.D., among the most frequently mentioned lasting benefits were the many personal and institutional (especially university) contacts that remained, and some changes in attitudes and habits of thought instilled in Iranian managers by their U.S. counterparts concerning the organization and carrying out of projects. An American education is highly prized in Iran, more so, it seems, than that of any other country. Iranians who have been fortunate enough to achieve one mount the bureaucratic ladder quickly. (At one point of our meeting with one Minister and about 15 of his top administrators the Minister surveyed his staff and said proudly to us, "Most of my men here were educated in the United States.")

We recognize, of course, that most Iranians who study in the United States do so with their own resources and always have, even in the days of A.I.D. Perhaps no more than 25% receive significant scholarship or financial aid. This emphasizes a point we have made elsewhere in this report: that the degree and quality of Iranian private initiative is not to be underestimated. It is a major driving force of Iran's rapid development.

Specific Programs Mentioned

1. Participant Training Program.

Perhaps the most frequently mentioned program was the A.I.D. Participant Training Program in which many Iranians received technical and professional education in the United States. This program received generally high praise

by those who remembered it, not only for its direct educational effect, but also for the linkages and networks of communication that are its heritage. The Technical Cooperation Survey Team tends to agree with this assessment.

2. Power Survey.

The power inventory, analysis, and projections undertaken by a joint team from the Detroit Edison Co. and Harza Engineering Co. was frequently mentioned as an ideal project and fondly recalled as a success story. A case study of this project is the subject of a separate appendix.

3. Regional Pulse Improvement Program (RPIP).

This program was mentioned as an example of a project that did not realize its full potential because of institutional misconnections. The project was located at the Karaj Agriculture College in an effort to introduce the U.S. land-grant college experiment station concept into Iran. The College, however, lacks effective linkages with national or local extension services. RPIP has thus flourished in a vacuum well-insulated from the seed growers of the countryside. It is questionable whether U.S. A.I.D. or the Iranian Ministry of Agriculture is more to be blamed for this failure. A.I.D. may have wrongly attempted to deposit a U.S.-style institution in the Iranian milieu without reference to the absorbtive or adaptive capacity of surrounding institutions. The Ministry of Agriculture may not have tried adequately to establish extension services for the College. The view in Iran, however, seems to be that the fault is ours.

4. Poultry Project.

A.I.D. is generally credited with having markedly increased the quality and quantity of hen and egg production. Reportedly, when Iranian women go shopping now they ask for "American chickens." This may be success enough.

5. Bilateral University Projects.

Pahlavi University with the University of Pennsylvania and Tehran University with Utah State were the most frequently mentioned, and both quite favorably. Since university relationships are the subject of a separate appendix, I will not comment further.

6. Other Projects.

Among other projects also recalled but not extensively discussed were:

Assistance to the Iranian Civil Service Commission
Public Administration Training Program
Range Management Program
Malaria Eradication

A.I.D. as a Precursor of Technical Cooperation

The Technical Cooperation Survey Team has asked itself whether the fact of A.I.D. in Iran had served to increase Iranian propensity for U.S. technical services over that of other countries. Our answer seems to be—yes, to a limited extent in certain areas. Given Iranian capacity for purchasing goods and services in world markets, factors of cost and availability tend to weigh more heavily than mere contacts or familiarity. The Iranian preference for U.S. technical services at a premium price, to the extent such preference exists, stems from a general bias that U.S. advisors can be trusted and that U.S. technology is the most advanced. To what extent this bias derives from the A.I.D. program as against other influences is impossible to say. A quotation from one Ministry of Water and Power official is revealing in this regard: "One former U.S. graduate student is more effective than a team of experts in promoting contacts with the United States."